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JUL 13 1928

TWENTY-FIFTH YEAR

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

Vol. XXV. No. 7
$2.00 a year. 30 cents a copy.

JULY, 1928

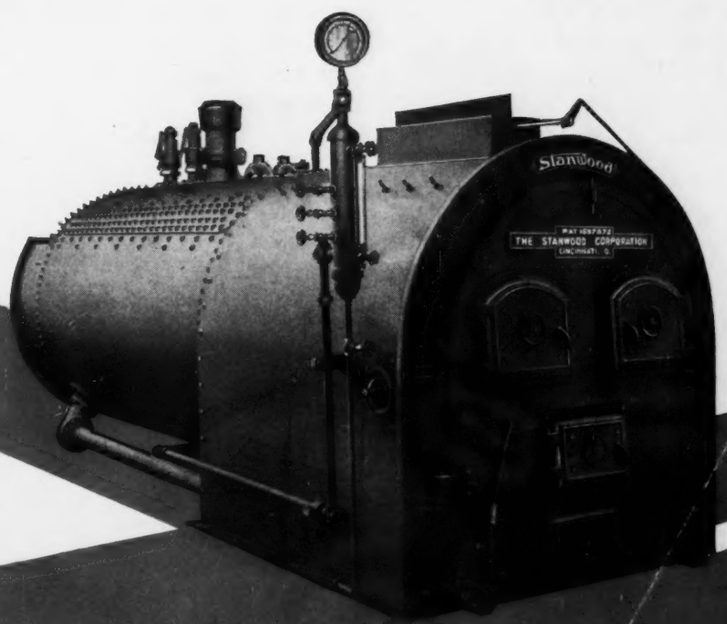
Heating & Ventilating Magazine Co.
386 Fourth Avenue, New York.

A perfect heating boiler

Unique circulation is so rapid that quick steaming with minimum fuel consumption is a real feature. Exceptionally low water line reduces excavation costs and permits installation where head room is limited. Ease of access permits quick cleaning. Front opening like a door and large manholes reduce this job to a matter of hours instead of days.

Without mudlegs or staybolts the attendant ills of stagnated water and corrosion are eliminated.

Full details of these and many other features are set forth in our new catalog which is yours for the asking. Write Dept. D-78.



ALL STEEL RIVETED CONSTRUCTION

Regularly built in sizes from 29 to 250 hp. (3,500 to 31,000 sq. ft. steam radiation) for working pressures of 15, 100, 125, and 150 lbs. We can build for higher pressures if desired.

THE STANWOOD CORPORATION

Manufacturers of Smokeless Boilers, Horizontal Return Tubular Boilers, Stacks, Breechings, Tanks, Feed Water Heaters and Throttling and Automatic Steam Engines.
Est. 1891. Cincinnati, O.

Stanwood Smokeless Boilers

V. 25, pt. 2

What Method of Heating?

By All Means Study This New Catalog Before Reaching Any Decision

IF YOU have a factory heating problem of any kind – new or old building, one floor or one department—investigate Clarage McCann Harrison Heaters.

This equipment (unit type) is direct fired, burning either oil or gas and delivering warm, clean air under positive fan pressure. No boiler plant, no boilers, no steam or return lines, pumps, traps, etc., are required. First cost is surprisingly low—on one large job $50,000 was saved; on a smaller job, $3000. Automatically controlled, operating costs are likewise reduced to rock bottom—75% to 85% heating efficiency—no engineer or fireman needed.

Very definitely it will pay you to have the facts on this Clarage development. Use the Coupon today.

CLARAGE

McCANN HARRISON HEATERS

CLARAGE FAN COMPANY,
Kalamazoo, Michigan.

Please send copy of your new catalog on Clarage McCann Harrison Heaters

Name .....

Address .....

City ..... State .....

for Lower Heating Costs

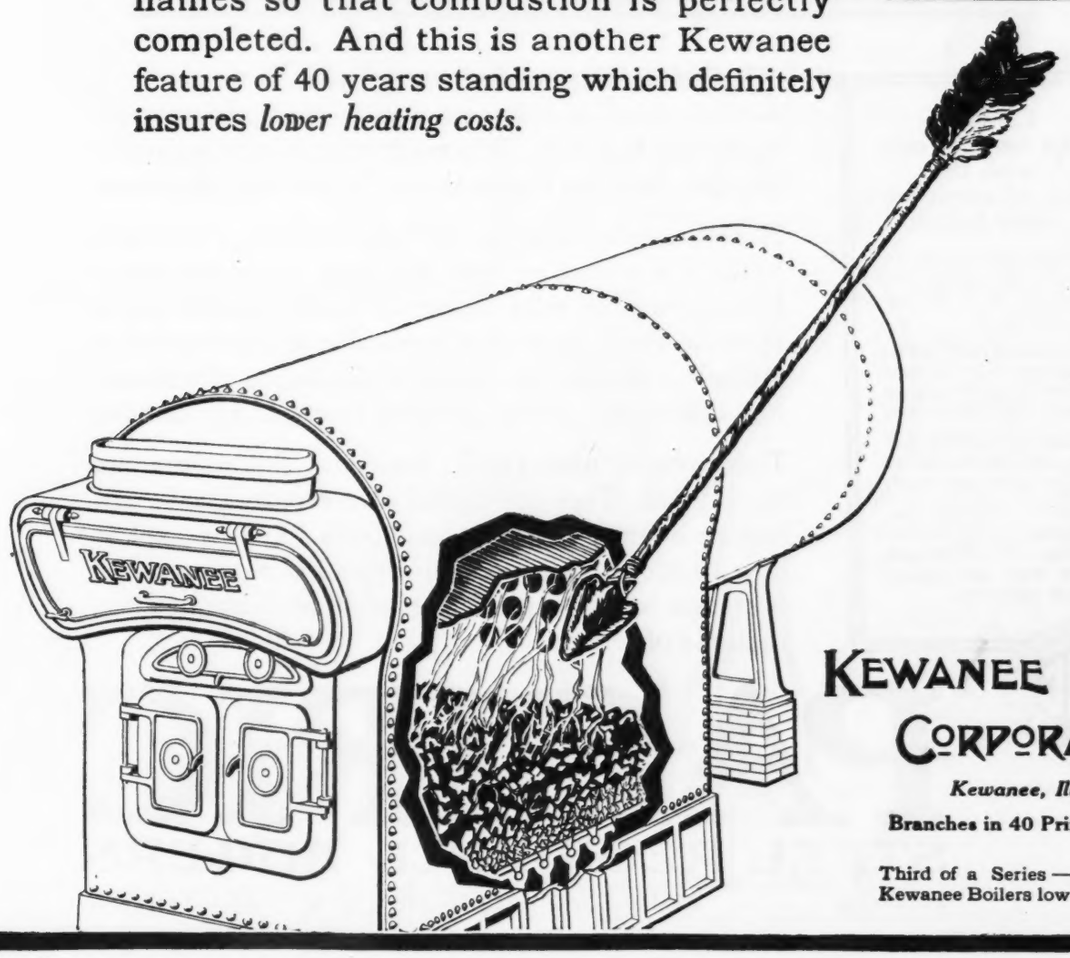
KEWANEE STEEL BOILERS

Burning fuel must have a lot of air—also generous space in which the air can mix with the hot gases.

A high and wide firebox lets the air penetrate the blazing fuel and mingle with the flames so that combustion is perfectly completed. And this is another Kewanee feature of 40 years standing which definitely insures *lower heating costs.*

HIGH FIREBOXES

The spaciousness of a Kewanee Steel Riveted Firebox is never 'skimped'—there is always ample room for a radiant heat giving fire.



KEWANEE BOILER CORPORATION

Kewanee, Illinois

Branches in 40 Principal Cities

Third of a Series — explaining why Kewanee Boilers lower heating costs.

THE HEATING AND VENTILATING MAGAZINE, published by THE HEATING AND VENTILATING MAGAZINE CO., at 386 Fourth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXV, No. 7, July, 1928. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

278123

Only $120 —Heat for the Entire Winter

Residence of Stiles Dixon, Architect, Fayetteville, North Carolina. One No. 102 Pacific Steel Residence Boiler installed on hot water system.

Compare this heating cost with the cost of operating other boilers

Equivalent heating load: 683 square feet direct C. I. steam radiation.

Fuel used (1926-7 heating season): 12 tons New River Smokeless coal at $10.00 per ton.

Cost of heating per square foot radiation: 17.6 cents per year.

Cost of heating per degree of temperature difference: .0088 cents per year per square foot radiation.

"ECONOMY" and "efficiency" are elastic terms — but there is only one way of interpreting exact figures on fuel cost. Wherever such figures are available, they bear out Pacific claims for low operating costs.

Here is another example of Pacific operating economy. $120.00 a season to heat this large, attractive home! If the somewhat mild climate of North Carolina seems to make these figures less applicable to the country as a whole, consider the low cost per degree of temperature difference. .0088¢ is a good record in any climate!

These results with Pacific Residence Boilers are not exceptional. They are typical of every-day Pacific performance under average conditions. Let us explain how Pacific construction principles insure economical operation with complete freedom from leaks or interruptions of service.

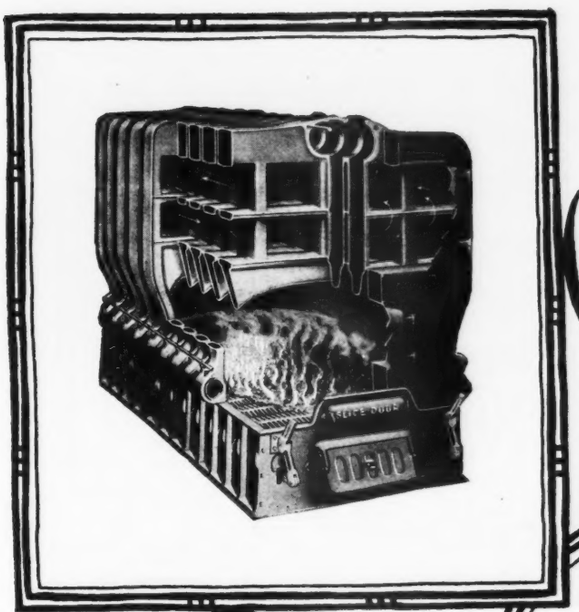
STEEL HEATING BOILERS PACIFIC WAUKEGAN, ILL. BRISTOL, PA. TRADE MARK REG. U.S. PAT. OFF.

PACIFIC

STEEL RESIDENCE BOILERS

Factories ~ ~ WAUKEGAN, ILLINOIS ~ ~ BRISTOL, PA.

why take chances?



MID WINTER

No heat

Complaints from owner, because the boiler is inefficient or has given out.

There is no difference in price between a Page Boiler, made for durability and easy, efficient operation, and just an ordinary boiler.

Why take chances, Mr. Heating Engineer, of the blame falling on your shoulders if the heating plant does not give service?

Monarch Water Tube Boilers represent the result of over 70 years of practical experience in the manufacture of heating apparatus. There is no deterioration in Page Boilers—they give constant service for many years.

Write for Catalogue No. 54 and our most favorable prices.

The Wm H Page Boiler Co

Branch Offices and Warehouses: Boston, 123 Beverly St.; Philadelphia, 1126 Washington Ave.; Cleveland, Rose Building; Brooklyn, 98 49th St.; Washington, 1117 15th St., N. W. Factory—Meadville, Penna.

General Offices: 200 Madison Avenue, New York City

THOUSANDS *of successful installations conclusively demonstrate* AERO *performance*

MANUFACTURERS may guarantee —but the owner holds the heating contractor responsible for the proper operation of his heating system. It is therefore of prime importance that the equipment be beyond criticism. With Aero Radiators, you have assurance of this, in addition to the maker's word.

Aero Radiation has been thoroughly tried out and proved in actual service. For more than six years, millions of feet of Aero radiation have been in operation in all types of buildings, throughout the United States, Canada, and many of the foreign countries.

Such a multitude of successful installations is the strongest possible guarantee that your Aero jobs will be permanently, completely, satisfactory.

The NATIONAL JACKETED BOILER

The National Jacketed Boiler is in step with the modern tendency toward attractive warming equipment. Finished in empire green with black trimmings, its good proportions and simple lines make it look what it is—a substantial and dependable heating unit. It appeals alike by its appearance, its performance, and its dependability.

NATIONAL RADIATOR CORPORATION

Ten plants devoted to National Service through these Branch Offices and Warehouses:

Baltimore, Md.—2622 Frisby Street Boston, Mass.—93-97 Oliver Street Milwaukee, Wis.—124-130 Jefferson St. New York, N. Y.—55 W. 42nd St.
Buffalo, N. Y.—259-265 Delaware Avenue Louisville, Ky.—1126 W. Breckenridge St.
Chicago, Ill.—2445 N. Keeler Avenue Cleveland, Ohio—935 E. 63rd Street Omaha, Neb.—108-112 S. Tenth St. Philadelphia, Pa.—121 N. Broad St.
Cincinnati, Ohio—Spring Grove and Elmira Avenue Pittsburgh, Pa.—1509 Arrott Building
Indianapolis, Ind.—431 W. Georgia Street Johnstown, Pa.—221 Central Ave. Richmond, Va.—3032 Norfolk St. St. Louis, Mo.—1042 Central Industrial St.
Washington, D. C.—2205 Fifth Street, N. E.

AERO THE NATIONAL RADIATOR

TWO TITUSVILLE HEATING BOILERS

are installed in the new Montauk Manor Hotel on Long Island, New York.

IT goes without saying that an ultra-smart hotel catering to a critical patronage *must have* ultra-modern equipment throughout. Correct and efficient heating is especially vital. ¶It is therefore significant indeed that two Titusville Firebox Boilers for this important duty of maintaining uniform comfort during those cold Long Island winters in the Montauk Manor Hotel shown above. ¶It reflects a nationwide confidence among many leading heating engineers, contractors and architects for Titusville Boilers based on their excellent past record. ¶Why not let us acquaint *you* with the advantages of this equipment?

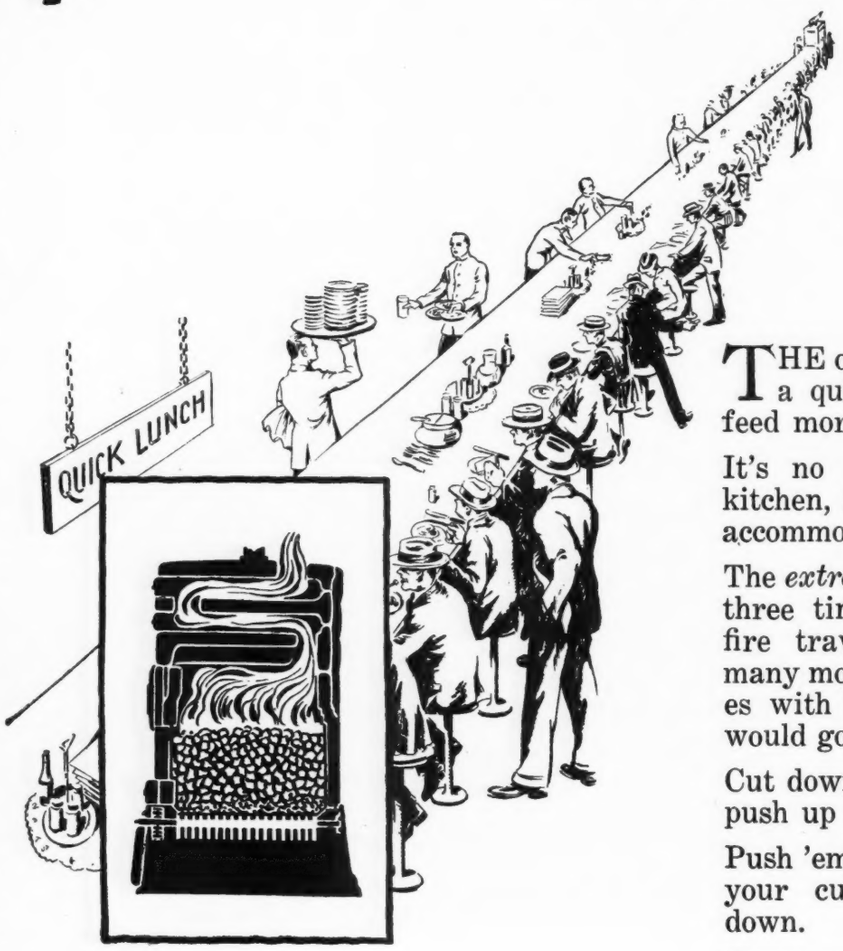
THE TITUSVILLE IRON WORKS COMPANY

Titusville, Pennsylvania

SALES OFFICES: New York, 152 W. 42nd St.; Chicago, Ill., 111 W. Monroe St.; Detroit, Mich., 204 Owen Bldg.; Buffalo, N. Y., Marine Trust Bldg.; Washington, D. C., 626 Woodward Bldg.; Cleveland, O.; 118 St. Claire, East Cleveland, O.; Pittsburgh, Pa. Farmers Bank Bldg.; Charlotte, N. C., 705 Realty Bldg.; Los Angeles, Calif., 940 Maple Ave.; St. Louis, Mo., 401-2 Bank of Commerce Bldg.

Burnham Boilers

The Longer The Counter The More It Will Feed



Here's a cross section of the typical Burnham Fire Travel.

All Burnhams have it. It's the long fire travel that makes the short fuel bill.

THE one sure way to make a quick lunch pay, is to feed more people quicker.

It's no use to enlarge the kitchen, if the counter won't accommodate enough stools.

The *extra* length of Burnham three times back and forth fire travel feeds just that many more heat hungry inches with heat that otherwise would go chimney scooting.

Cut down the scoots and you push up your profits.

Push 'em up because you pull your customers' fuel costs down.

Every one claims their boiler does just that. The difference is, the Burnham doesn't claim, but how it does *do.*

Send for Catalog 67 and put Burnham service to work for you

Burnham Boiler Corporation

IRVINGTON, N. Y.

Representatives in all Principal Cities of the United States and Canada

Men light cigars and cigarettes from underneath. Pipes are hard to light, for men must work and puff to create an artificial draft to pull the flame down. Spencer Gable-Grates are sloped to make fire burn up-hill, the way it burns easiest and best.

When coal piles up at the bottom of a chute, workmen take a shovelful from the bottom to start the flow again. Fuel in the Spencer Magazine flows down by gravitation till the Gable-Grate is full. Then it waits for fire to burn some fuel away to start it down again.

this new and powerful advertising introduces two new Spencer Heaters

On July 14 the dramatic story of the fire that burns up-hill will be spread before the eyes of more than three million families. On that date the first of a new series of Spencer Heater advertisements will appear in The Saturday Evening Post.

These are the pictures and this is the headline that will appear in the first advertisement of a bigger, broader, more comprehensive Spencer advertising campaign than ever before.

At the same time, Spencer announces to you the creation of two new Spencer Heaters, designed to burn not only No. 1 Buckwheat anthracite, but by-product Pea coke and any non-coking graded fuel.

Here is a wider sales opportunity than ever before, for you and every heating contractor. Here are Spencer Heaters designed to burn any graded fuel. Here are Spencer Heaters so simply constructed that they are as easy to erect as any heater now being manufactured. Yet these new heaters, improved as they are, are offered to you at new and lowered prices.

To help you share in the success of heating contractors who have made a huge success of Spencer Heaters, Spencer announces a new co-operative selling plan that will help you to lift your business out of competition and multiply your income.

Write for illustrations, descriptions and capacities of the new Spencer Heaters, and for details of the new selling plan that means larger sales and certain profits for you. Spencer Heater Company, Williamsport, Pa.

SPENCER
steam, vapor or hot water
HEATERS

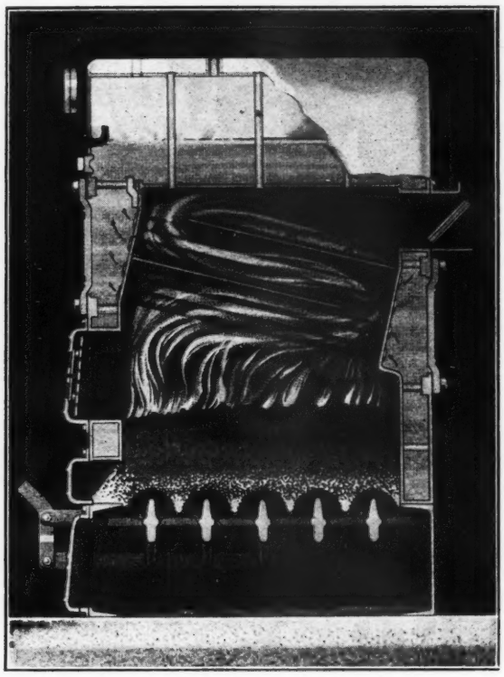
KNOWLTON WATERTOOB STEEL BOILERS

"A Fact"

Is a truth—

A proven proposition

The biggest "Fact" in connection with heating boilers to-day is—That "Knowlton Watertoob Steel Heating Boilers"—burn coal to the highest degree of satisfaction — particularly No. 1 Buckwheat Coal.



Coal—Oil—Gas

The "Facts" of Satisfaction are:

1. **Length of Boiler Life.**
2. **Economy of operation.**
3. **Rapidity of heat supply.**
4. **Ease of thorough cleaning.**
5. **Low maintenance cost.**

The Initial cost of a boiler should always be secondary to complete Heating Satisfaction.

Consider this "Fact" before you decide on your next boiler.

Write for booklet "Complete Heating Satisfaction" which tells the rest of the KNOWLTON Story.

ORR & SEMBOWER, Inc., Reading, Pennsylvania

(Established 1885)

208 N. Clinton St., CHICAGO **50 Church St., NEW YORK**

ROSS STEEL BOILERS

No. 1

No. 2

No. 3

No. 1. Loew's Plaza Theatre
Corona, L. I.
No. 2. Kingsway Theatre
Brooklyn, N. Y.
No. 3. Huntington Theatre
Huntington, L. I.
No. 4. Queens Theatre
Jericho Turnpike, L. I.
No. 5. Albermarle Theatre
Brooklyn, N. Y.

Heating Contractor,
C. & J. Bender, Brooklyn, N. Y.

No. 4

No. 5

A size to suit every need.

THE newer theatres not only in the East but all over the country are using ROSS STEEL HEATING BOILERS because they operate efficiently, economically and are built to outlast the building.

Heating contractors everywhere are turning to Ross Steel Boilers for assured, dependable service.

Write for catalogue and full information

The Frost Manufacturing Co.
SINCE 1851

Galesburg Illinois
Branches in most leading cities

COIL

STEEL HEATING BOILERS AND WATER HEATERS

In Coil Boilers, the heat passes through and over more heating surface than in the average heating boiler.

This surface is highly effective because it is "within view" of the flame, hence, capable of absorbing the radiant heat.

This results in fuel savings of from 25% to 40%, as many users of Coil Boilers have told us.

Not only are Coil Boilers doing this with oil but with coal.

If desirable, Coil Oil Burning Boilers can be fitted with grates, shaking apparatus, etc., in thirty minutes time. Write for catalog.

MONITOR BOILER COMPANY

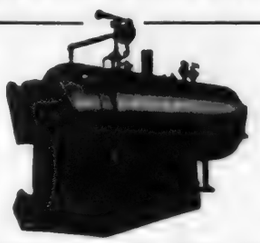
1505 Race Street

PHILADELPHIA, PA.

"Still another Coatesville Boiler Installation"

The new home of the Philadelphia Wholesale Drug Co., (shown above) will be heated by TWO COATESVILLE TYPE "A" WELDED ALL STEEL HEATING BOILERS. This building was designed by Rankin and Kellog, Phila., Pa.; built by Turner Construction Co., — and the Heating Engineer and Contractor was Wm. M. Anderson of Philadelphia.

There are numerous important buildings which are being economically heated by COATESVILLE BOILERS, — and many others now under construction, in which "Coatesvilles" will be used. We'll gladly send you a list of these buildings upon request.



ABOVE: A Coatesville All-Steel Portable Fire Box Heating Boiler. These Boilers being self-contained, require a "minimum amount of labor" for installation. Door Hinge Pins are "adjustable" insuring tightness,—and a special method of bracing crown sheets does away with long staybolts.

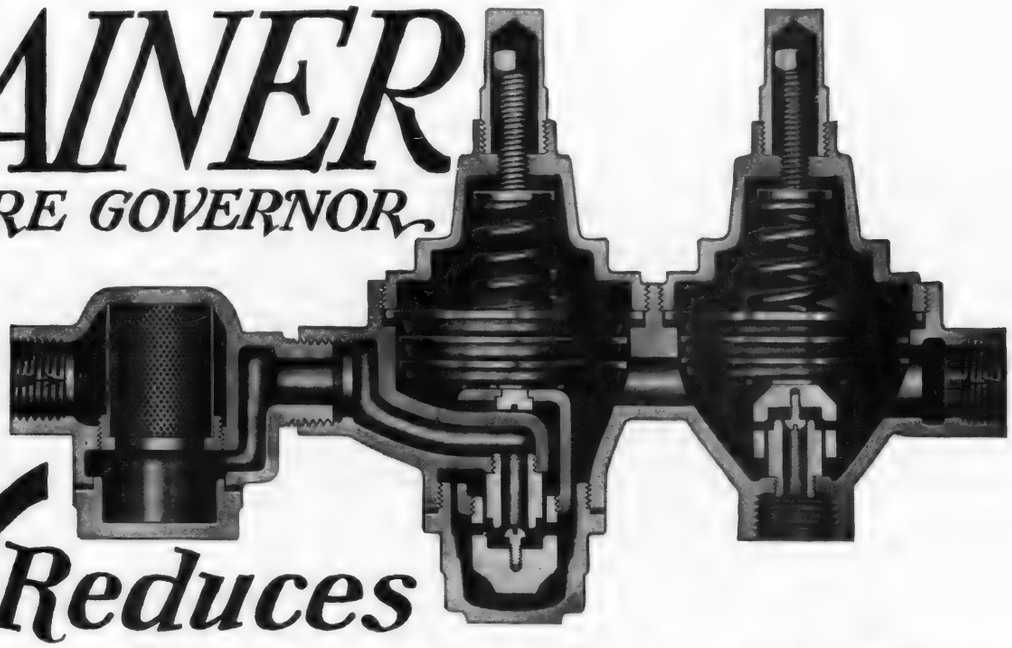
COATESVILLE BOILER WORKS

Boilers - Tanks - Steel Plate Work

Main Office and Works—COATESVILLE, PA.

Philadelphia 111 S. 15th St. | Pittsburgh Union Trust Bldg. | New York 30 Church St. | Baltimore Lexington Bldg. | San Francisco 945 Pine St. | Boston 141 Milk St. | Newark 60 Park Place

The KAINER PRESSURE GOVERNOR



Reduces Installation & Operating Costs on Hot Water Heating Systems

The Kainer Pressure Governor, on any hot water system, provides a simple, safe and accurate means for pressure reducing and relief service. By eliminating costly expansion tanks with their necessary fittings *it greatly reduces the cost of installation.*

By insuring quicker circulation and more uniform flow of water it *reduces considerably the cost of operation*, and also by properly filtering the water eliminates all rust and scale troubles.

Valve Body Construction
is entirely of bronze, with easily accessible adjustment screws concealed beneath removable bonnets.

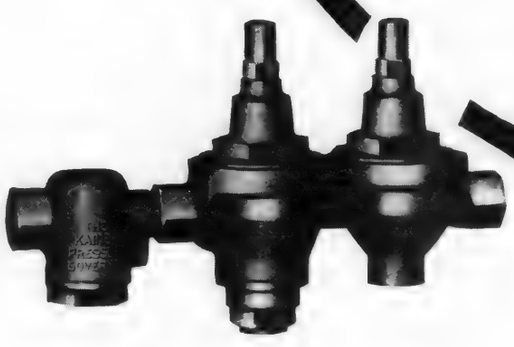
The Pressure Reducing Unit
is designed to permit a full flow of water, thereby quickly filling the system when first installed.

Filter Screen
is ruggedly constructed of perforated copper (immune from rust or corrosion) and is easily removed for cleaning.

Bronze Compression Springs
—phosphor bronze compression springs, made with the utmost care, insure proper actuating of valves.

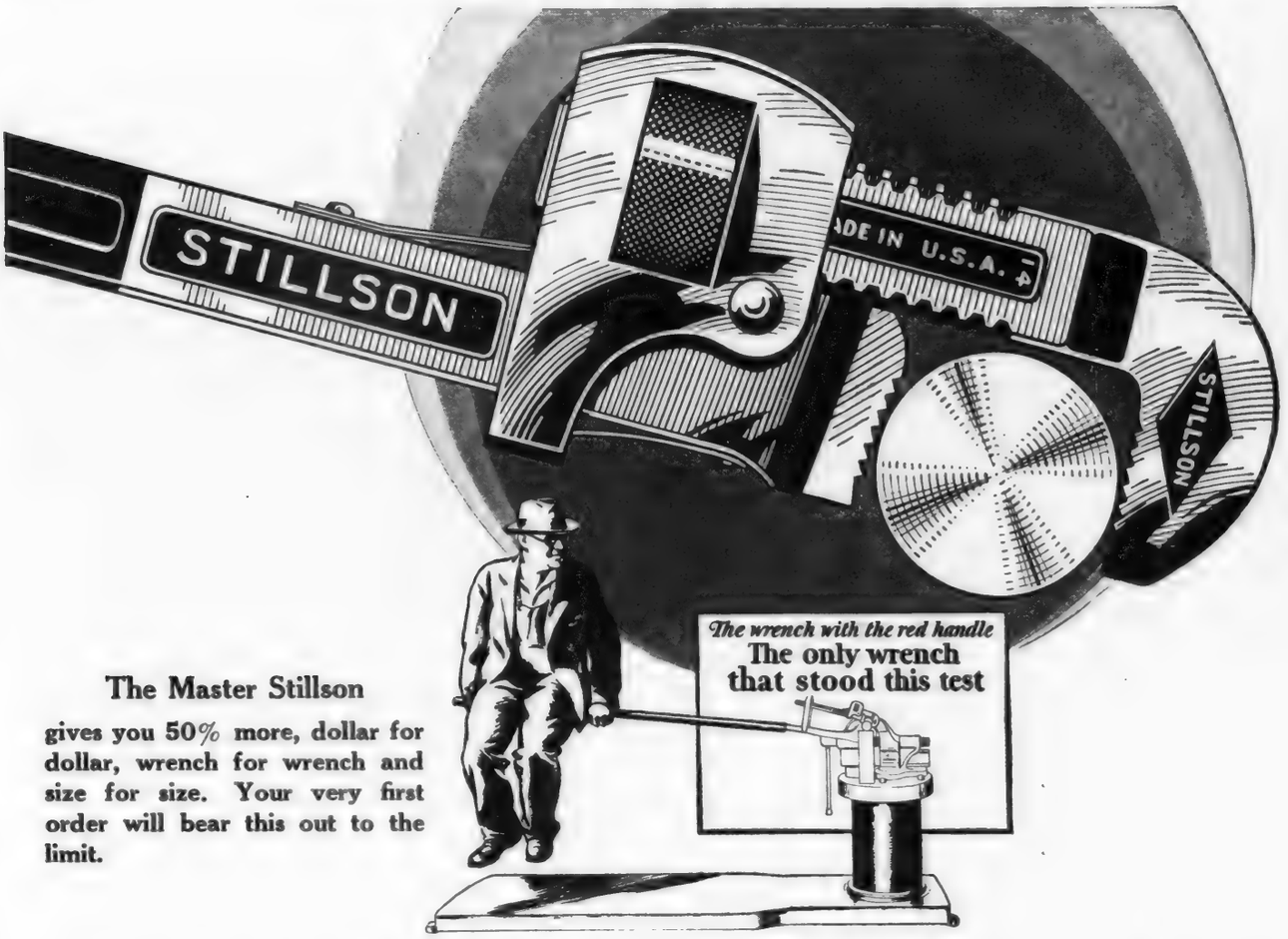
Quick—Easy Adjustment:
Each valve unit has a set screw under the bonnet, permitting quick and easy adjusting if necessary.

Removable Seats and Discs



Will give a lifetime of service without bothersome adjustment and attention. Unqualifiedly guaranteed.

KAINER & COMPANY
CHICAGO
761-763 Mather Street
Manufacturers of Plumbing and Heating Specialties



The Master Stillson

gives you 50% more, dollar for dollar, wrench for wrench and size for size. Your very first order will bear this out to the limit.

More Strength in the Bar

A load of 1800 pounds exerted on the Master Stillson in the normal position of use failed to bend the bar or damage any part of the wrench. This is the only pipe wrench of its kind that has been able to survive this test without distortion or without breaking.

More Toughness in the Jaw

An improvement in Walworth's own method of heat treatment has increased the strength of the Master Stillson's jaw against strain, twist or sudden impact.

More Resistance in the Teeth

New processes of steel hardening and a slight change in the angle of the teeth have given them ample resistance to survive shocks and excess loads. They will neither shear off nor flatten under strains and pulls which even the old Walworth Stillson could not withstand.

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa., and Attalla, Ala.

WALWORTH INTERNATIONAL CO.
Foreign Representative. 11 Broadway, N. Y.

Distributors in Principal Cities of the World

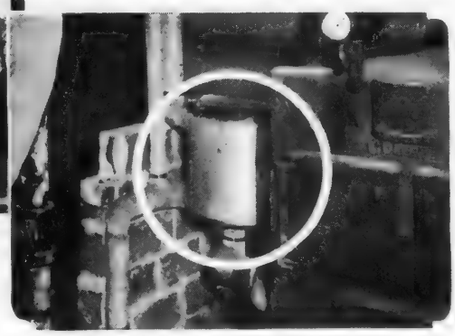
WALWORTH CO., LIMITED
10 Cathcart St., Montreal, P. Q.

MASTER TRADE MARK STILLSON REGISTERED U.S. PATENT OFFICE **STILLSON**

Excelso Triple Copper Coil Heater shown here saves Hot Water costs for users in any building, small home to large apartments, hotels, etc.

In MILWAUKEE

as in all cities of the country, the "call" is for the *original* Excelso Water Heater.



Practically Costless HOT WATER

—and ideally clean and pure—that is the story of water heated for domestic uses the Excelso-*indirect* way!

The fire of the steam or vapor heating boiler does double duty. The care and cost of separate fuel is saved. A constant and uniform supply of hot water for every home, hotel or office purpose is secured for negligible cost.

Put your recommendation and sales effort behind the *original*, the *leader*. Reap the profit rewards it is bringing to those who back the popular call for it with wholehearted sales push of their own.

Open View of Triple Copper Coil Excelso Heater. Not a drop of water touches iron. The flow is entirely through the copper coil and patented ground joint brass connections.

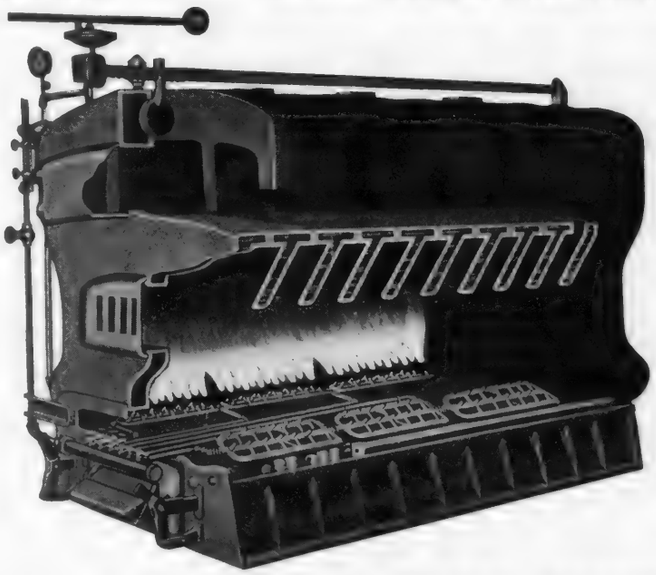
Write for catalog giving complete installation information.

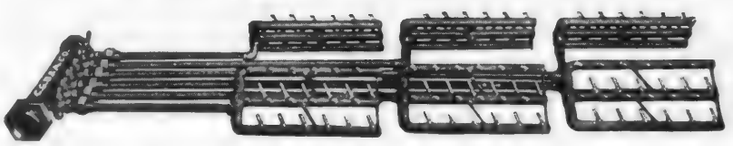
Excelso Products Corporation
DIVISION OF AMERICAN RADIATOR COMPANY
59 Clyde Ave. *Buffalo, N. Y.*

EXCELSO WATER HEATERS

SIZES FOR ONE FAMILY OR ONE HUNDRED FAMILIES

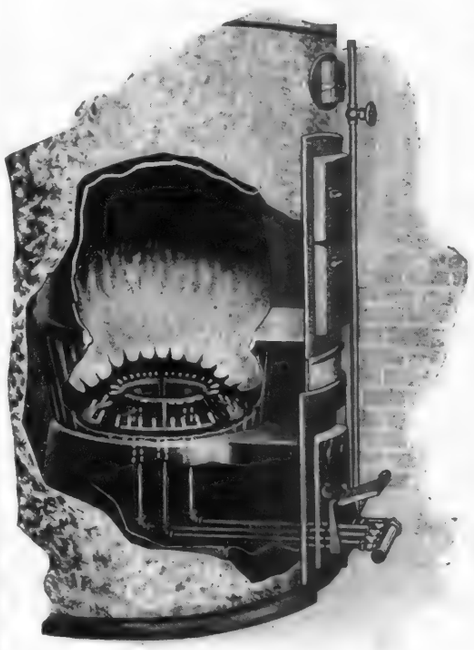
BARBER Patented JET GAS BURNERS





The hot water or steam sectional boiler illustrated above is equipped with a Barber Jet Gas Burner made up of six No. "U-25" Units.

It's Easy to Sell Gas for House Heating with Barber Conversion Burners

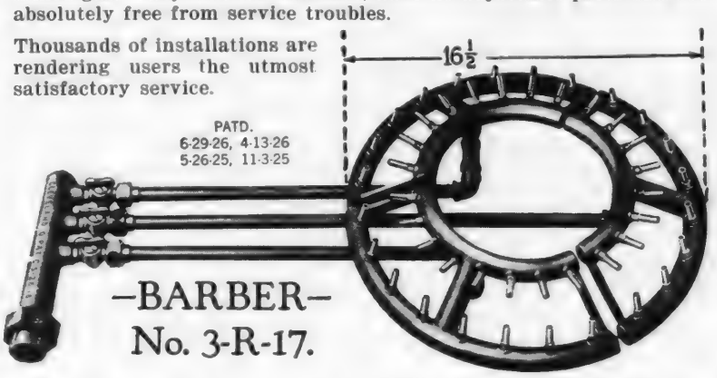


Above is shown the proper installation of the No. "3-R-17" Barber Burner through the ash pit opening of a warm air furnace. The same idea is carried out in a round boiler; that is, by placing the burner low in the fire-box, the longest possible heat travel is obtained.

No new furnace or boiler is required, and the correct Barber Burner assembly properly installed will make any good coal-burning furnace or boiler a highly efficient gas heater—that should develop an efficiency of better than 80%.

Acquaint yourself with the *real facts* about conversion work—when properly done with Barber CONVERSION Burners. These burners are designed on a unique and scientifically correct principle that develops the highest efficiency of any gas burner operating on atmospheric pressure. They work equally well on artificial, natural or mixed gas. They will not back-fire, have no adjustable parts and are absolutely free from service troubles.

Thousands of installations are rendering users the utmost satisfactory service.



To get your share of this very profitable business, you should start your sales campaign right now—you'll find it easier to interest your customers before they lay in their winter supply of coal. We will furnish you with circulars and other effective sales helps. Write for them to-day!

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

Repeat Orders Are Coming In Already!

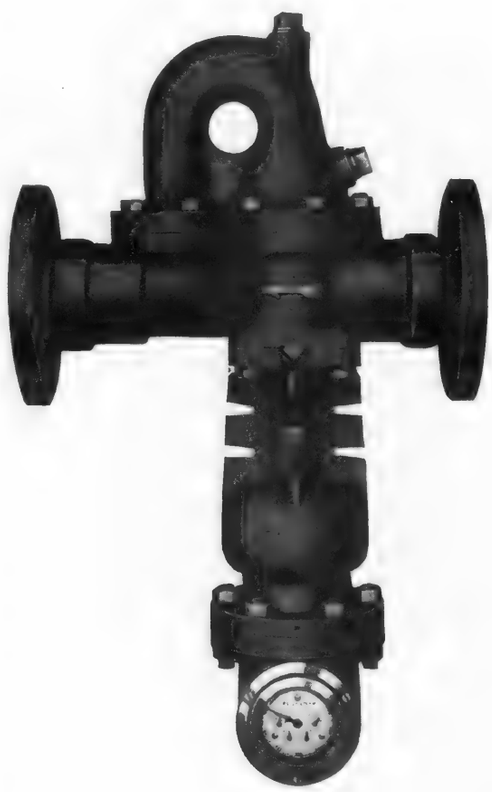
Shunt Meter fills need for low priced, practical meter for small lines

Many firms purchased Shunt Meters when they were first offered a few months ago because they were offered by the "Builders of the Venturi Meter."

Some of these same firms have placed additional orders during the past month because now they know the value of the Shunt Meter in their own service.

This evidence adds weight to our belief that everyone interested in economical steam or air measurement should have full information about these Meters.

Let us send Bulletin 234—it tells the whole story.



BUILDERS IRON FOUNDRY

"Builders of the Venturi Meter for 36 years"

11 Codding Street Providence, R. I.

Put the boiler water line in good hands

IT'S a lot easier to remember *once* to install or specify the new McDonnell & Miller Self-Cleaning Duplex Feeder, than to expect some one to continually remember the boiler water line. The boiler without a duplex feeder is as frail as the human memory. Forget once to turn the feed valve on at the right time, and it means cracked sections or a burned boiler. Forget to turn it off, and it means flooded boilers and cold buildings.

Hundreds of boiler owners have found that the cheapest insurance against this expense and inconvenience is the McDonnell & Miller Duplex Feeder.

New in everything but experience—

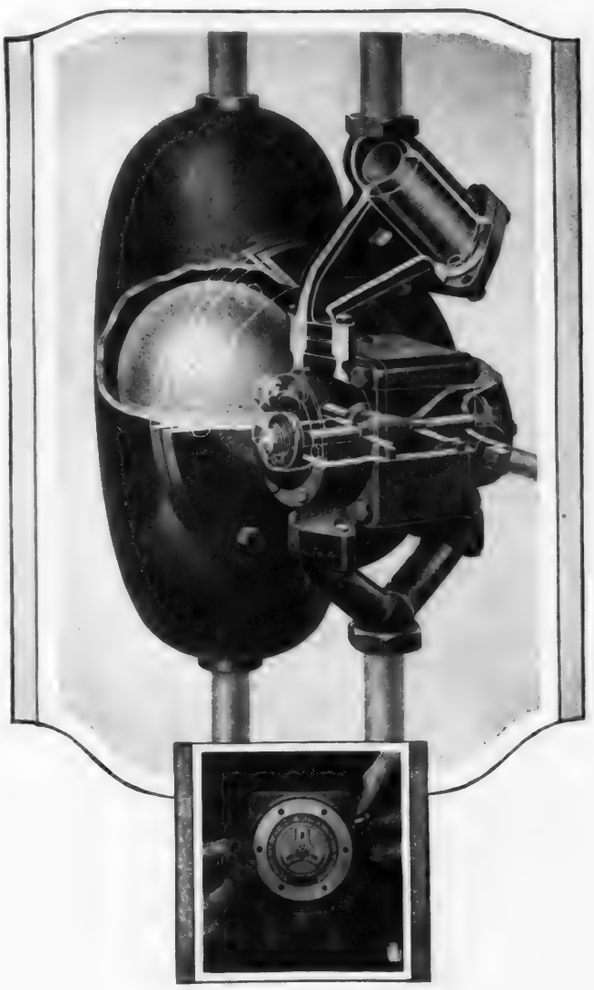
In the new *self-cleaning* McDonnell & Miller Feeder they have found *absolute protection.* It is the first feeder to have rotary self-cleaning valves—the first feeder to have capacity sufficient to supply the requirements of *any* heating boiler—the first feeder to have adjustable water levels and differentials—the first feeder to give perfect performance without cleaning regardless of the hardness of the feed water.

The "Rolls Royce" of feeders—

When you look at this feeder you see a totally new standard of feeder design and construction. It has only one float—only one moving unit. The feed water does not enter the feed chamber but is fed with full city pressure behind it, exactly as if the feed-valve were manually operated. The fewer parts are made with machine-tool precision. Each feeder is factory tested under actual operating conditions before shipment. It is built for *continuous* unfailing service—and *gives* it.

McDONNELL & MILLER
710 Wrigley Bldg., Chicago

McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"



"Valves that stay new"—

The rotary, cast-bronze valve-discs turning on monel seats, "work in" to a better and better seat with every movement of the float.

Fully adjustable—

Water line can be changed to one inch higher or lower *after* installation is made, and differential between supply level and overflow level may be set at 1, 2, 3, 4 or 5 inches.

Facts that you should have—

The interesting description of the operation of this new feeder, and remarkable facts about actual operating records, are covered by a new 8-page booklet. This booklet also contains capacity curves and installation data that every engineer should have. Just mail the coupon for your copy.

McDONNELL & MILLER
710 Wrigley Bldg., Chicago
Please send 8-page booklet containing capacity curves and other data.

Name and title.....

Address .....

.....

Company H7

A typical welded underground steam main showing Badger Self-Equalizing Expansion Joints welded right into the line. The pipe line is anchored and guided by standard Badger Guides, which are embedded in concrete piers. The simple method of anchorage, obtained by welding lugs to the pipe on both sides of the guide strap, effects a considerable reduction in the installation cost.

Central Station Heating Companies, municipalities, engineers and contractors are invited to consult with our engineering department regarding proper selection and placement of Badger Self-Equalizing Expansion Joints in their underground pipe lines.

Free Expansion

of underground mains

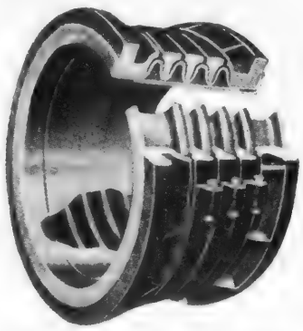
is easily secured at a low installation cost by

BADGER

Self-Equalizing Expansion Joints

These joints have proved their complete dependability and endurance in service. They secure the maximum flexibility and a free movement of the pipe line, without distortion.

The expansion element consists of a one-piece copper tube which is deeply corrugated by a special rolling process that insures uniform thickness of metal throughout. External equalizing rings are placed between all corrugations to distribute the movement evenly over all the corrugations. Consequently the wear is very slight and the elements will last for years, without attention, if the pipe is properly guided and anchored. As there are no sliding members, no stuffing box or packing is required. Consequently maintenance cost is saved.



For Superheated Steam

For maximum durability under high temperatures Badger Self-Equalizing Expansion Joints are provided with independent telescoping monel metal sleeves, inside of the copper corrugations. This provides a smooth inside surface, while the joint remains packless and leakless in service. Monel metal lined Badger Self-Equalizing Expansion Joints.

BADGER Engineering Service

Badger engineers are designers, manufacturers and installation experts for the following and kindred power plant products:—Pipe Bends, Chemical Apparatus, Copper and Sheet Metal Work and Copper Boilers.

Consult us freely. Write for new Catalog.

E. B. BADGER & SONS CO.

75 Pitts Street, BOSTON, MASS.

New York: 271 Madison Ave. **Chicago: 2831 South Parkway**

Representatives in all principal cities.

An installation showing **Badger Self-Equalizing Expansion Joints** with open pipe ends for welding into the pipe line. Standard Badger pipe guides are placed on the pipe, with the supports ready for embedding in concrete piers. These guides may also be used for anchors by welding lugs to pipe on each side of the guides.

Three Convenient Types of Badger Self-Equalizing Expansion Joints

Welding Type—fitted with open pipe ends ready for welding into the pipe lines. This type eliminates flanged joints in welded lines.

Flanged Type—for pipe lines with flanged joints. The Badger Self-Equalizing Joints may be fitted either with standard 125 lb. flanges or with extra heavy 250 lb. flanges, as specified.

Double Units—Badger Double Expansion Joints can be furnished mounted, anchored and guided on a structural steel frame. The entire assembly is ready for installation, at a considerable saving in time and labor cost. If desired either a single or a double service outlet may be included.

To take up expansion and vibration of low pressure lines.

Badger Single and Multiple Corrugation Expansion Joints

are flexible, leakless and packless. Install them in every exhaust outlet and in exhaust or low pressure lines to protect equipment and piping from vibration and expansion stresses.

BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · TRADE MARK · E. B. BADGER & SONS COMPANY

BUILDING WONDERS NEVER CEASE

OUT beyond the harbor a deep toned whistle announces the approach of a great ocean liner racing for her port, with a new trans-Atlantic record . . . overhead the roar of powerful motors signals the conquest of the air . . . in the studio the click of a switch sends a radio message around the globe . . . this is the day of speed . . . of wonders . . . of progress unrestrained.

In the midst of these bewildering changes, great towering structures rise along the avenues of America's leading cities . . . others are being planned . . . each one seems more beautiful, more enduring, more wonderful. The genius of the modern architect and the skill of his plans will stand as wonders of this age; for while he brings forth a new interpretation of beauty and charm he has endowed his creations with enduring qualities. There has been no compromise with dependability in the selection of materials used—only products of acknowledged leadership entered these magnificent edifices.

The pipe lines . . . the very arteries of these great structures . . . how necessary that they should efficiently perform . . . that they should not fail. Underneath floors and behind walls, they silently and faithfully carry on . . . meeting the increasing demands of passing years, that service shall endure.

The New York Life Building, illustrated, is another addition to the long list of America's superstructures whose major pipe tonnage is "NATIONAL"—The Recognized Standard for Building Purposes.

NATIONAL TUBE COMPANY
PITTSBURGH, PA.

NEW YORK LIFE INSURANCE CO. BUILDING
NEW YORK CITY
Architect: Cass Gilbert
General Contractors: Starrett Brothers
Heating Contractors: Baker, Smith & Co. Inc.
Plumbing Contractors: W. G. Cornell Co.

CON-TAC-TOR

OPERATE UNIT HEATERS AUTOMATICALLY — and

The No. 26AR Convoswitch
List Price $20.00

Above is shown the No. 26AR Convoswitch which controls the Unit Heater by stopping and starting the fan as the temperature rises and falls. The small illustration at the right shows the No. 56R Aquaswitch which, when strapped on the steam pipe leading to the heating coils, will prevent the fan from operating unless the heater is sufficiently warm to insure warm air being sent out into the room. The No. 56R Aquaswitch has a list price of $17.50 and is known as a limiting control.

add to heating efficiency
subtract from the cost of fuel
multiply the possible comfort
divide the cost of labor

Figure it out — the operation of any unit heater automatically controlled will save, within a short time, the cost of the controlling instruments. This saving will result from the greater efficiency of the heater which, so controlled, does not run either too short or too long a time. There is no fuel wasted in overheating the room which often results in manual control. No interruptions in production are necessary to keep the room at the desired temperature as no one is subject to frequent trips to the switch to start and stop the heater.

The increased comfort of constant temperature maintained at healthful and stimulating degrees will speed up the production in the plant, reduce absences due to sickness and keep morale at a high point.

A complete set of Con-Tac-Tor controls for a Unit Heater will sell at a list price of only $37.50 and this is, of course, subject to trade discounts. When making an installation of Unit Heaters, do not overlook the benefit and saving in properly maintaining the room temperatures. Investigate Con-Tac-Tor Controls and specify them for the next installation.

Write for Complete Information—No Obligation

ABSOLUTE CON-TAC-TOR CORPORATION

ELKHART INDIANA

A
man earns
the title of ACE
when he does his job
better than his fellow work-
ers. There are industrial Aces
as well as individual Aces. ♠ Heat
Transfer Products, Inc., is an organization
of Aces. It was conceived and built around
one big idea—to design and manufacture in its
own plant a complete line of heat transfer apparatus.
♠ Its ancestors were shipbuilders for almost a half cen-
tury. It inherited one of the most modern plants in the
country. Engineering ability of the highest type ran through
its veins. The most modern machinery formed its bones and
sinews. ♠ But machines are dependent on human brains for
efficient operation, and production is built on experience. ♠ And
so the hunt for Aces began. One engineer was selected because of
his uncanny knowledge of heat transfer. Another because he was
internationally recognized as the foremost refrigeration authority.
Still another because he excelled in design. ♠ Engineers, designers
metallurgists, superintendents, foremen, riveters, welders, galvan-
izers, were mobilized. Thirty buildings, tons of machinery,
locomotive cranes, shipping docks and a myriad of manu-
facturing essentials were coordinated and geared for
economical production. ♠ Heat Transfer
Products, Inc., now
ranks as one of the
important concerns of
America. When you bring
your heat transfer problems
here, remember that every man
who works on your job, is an

ACE

Engineering data and estimates will gladly be furnished on equipment for the following applications:

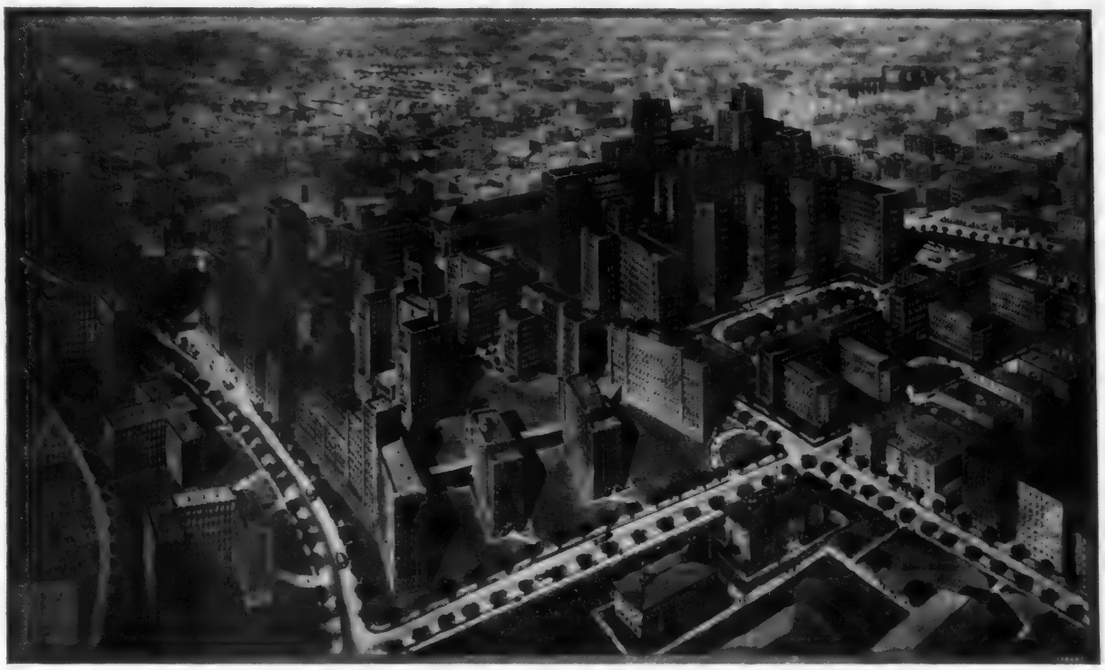
Power Plants	Chemical Plants	Refrigeration
Oil Refining	Air Conditioning	Textile Mills
Gas Plants	Heating and Ventilating	Laundries, etc.

Send for information on the type of apparatus in which you are interested.

HEAT TRANSFER PRODUCTS, INC.
A division of THE STATEN ISLAND SHIPBUILDING COMPANY, 90 West Street, New York

KIELEY

For Pressure Control



The Medical Center
New York City

Architect—
J. Gamble Rogers
Engineers—
Werner Nygren
Heating Contractors
Baker Smith & Co.
T. F. Hall, Inc.
Gillis & Geoghegan
E. Rutzler Co.

THE Reliability of Kieley Specialties is proved in their acceptance by leading Architects and Engineers for the largest projects.

The Medical Center when entirely completed will be the largest group of Hospital Buildings in the world.

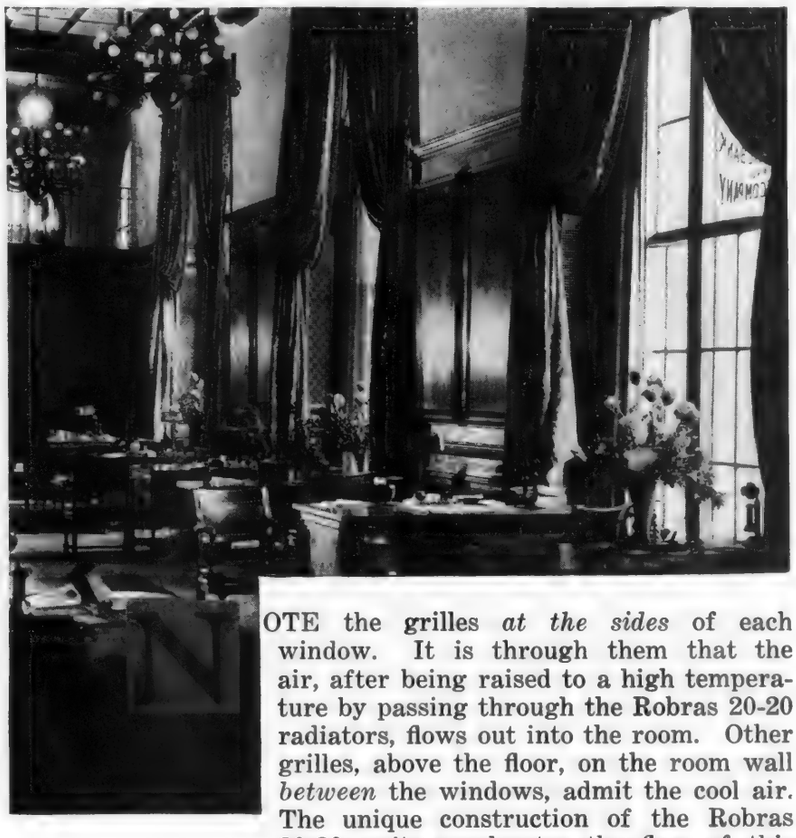
Kieley & Mueller Pressure Reducing Valves and other Specialties form part of the Mechanical Equipment.

KIELEY & MUELLER, Inc.

34 West 13th Street New York City

ROBRAS 20-20 RADIATORS—*Are In The Wall—Out Of Sight*

IT was required, in the beautiful Fifth Avenue Branch of the Chatham Phoenix National Bank, that the windows come down to the floor line. The only places left available for radiators were the small wall spaces between the windows. Because Robras 20-20 Radiators occupy only a fifth the space occupied by equal cast iron radiators, they were here used to give the required amount of heat. They are in the walls, between the windows, out of sight and out of the way.



NOTE the grilles *at the sides* of each window. It is through them that the air, after being raised to a high temperature by passing through the Robras 20-20 radiators, flows out into the room. Other grilles, above the floor, on the room wall *between* the windows, admit the cool air. The unique construction of the Robras 20-20 units accelerates the flow of this air. Throughout the coldest days of the past winter, these radiators kept this large room luxuriously warm.

The room itself was designed by Lewis S. Weeks, Architect. Arrangement was laid out by Jaros and Baum, Heating and Ventilating Engineers. It was installed by George E. Gibson Co., Heating Contractors.

ROME BRASS RADIATOR
CORPORATION

ONE EAST FORTY-SECOND STREET :-: :-: :-: NEW YORK

7 Years Behind—

for laughing

Everybody laughed when ABC was announced seven years ago. "It will never work," they jeered. But ABC did work. Still they kept on laughing. Gradually, a few saw the truth. They discovered that ABC did not burn up because it was installed in the ashpit. They found out that the proper kind of circular flame is highly efficient.

And they stopped laughing and paid ABC the compliment of following its leadership. The last oil burner exposition showed that many others have made a right-about-face. But they are seven years behind!

The Automatic Burner Corporation has spent seven years and thousands of dollars in perfecting the rotary, in-the-ashpit-method of burning oil. From their well-equipped research and developing laboratory have come many valuable discoveries but none so important as the new Heat King.

The manufacturer who knows more (through years of experience) about making rotary, in-the-ashpit burners, should, logically, be able to build the better burner.

Heat King — the burner that is seven years ahead—will open a new field of sales, and profit. If you are interested in an exclusive agency, it would be advisable to write at once to the Automatic Burner Corporation, 312 North May Street, Chicago, U.S.A.

$295
Completely Installed
Tankage Extra

Heat King
AUTOMATIC OIL BURNER
AS QUIET AS THE DAWN

A brother of the famous A B C

The Answer to your Ignition Problem

THE MECHANICS of the Webster Ignition Transformer are simple, with a resultant operating efficiency that is unusual . . . For twenty years the Webster Laboratories have studied and solved the problems of ignition devices . . . So thorough have the Webster engineers been in the development of this ignition unit that it is standard equipment on a great majority of oil burners now manufactured . . . Every Webster Ignition Transformer part is Webster-designed to meet a definite demand . . . Thus Webster controls every step in the precision-like manufacture of this transformer . . . The advantages of Webster Ignition Transformer service on your product will be explained by the Webster engineering staff.

WEBSTER ELECTRIC CO., ***Racine, Wis.***

"Specialists in Oil Burner Ignition"

The Webster Ignition Transformer can be furnished with either single or double high tension terminals, for a variety of voltages and frequencies.

Webster Ignition Transformer

—and they, too, installed

HARDINGE FUEL OIL HEAT

Hardinge installations, whether large or small, domestic, industrial, or cultural, are giving perfect, satisfactory service year after year. Ask for our 10-Year Guarantee.

Heating engineers rely on the Hardinge to furnish economical heat and domestic hot water. Dependability and long life are built into it. Your inspection is invited.

For any heating requirement, there are two models, Domestic and Industrial, in 12 different sizes and combinations provide the ideal unit. Clean, quiet, automatic, carefree—every advantage of Fuel Oil heat is best exemplified by Hardinge. Simple, rugged, durable in its construction, you can safely specify HARDINGE FUEL OIL HEAT and know that your judgment is sound.

Hardinge Brothers, Inc.

Manufacturers of Precision-Built Machines for 38 years

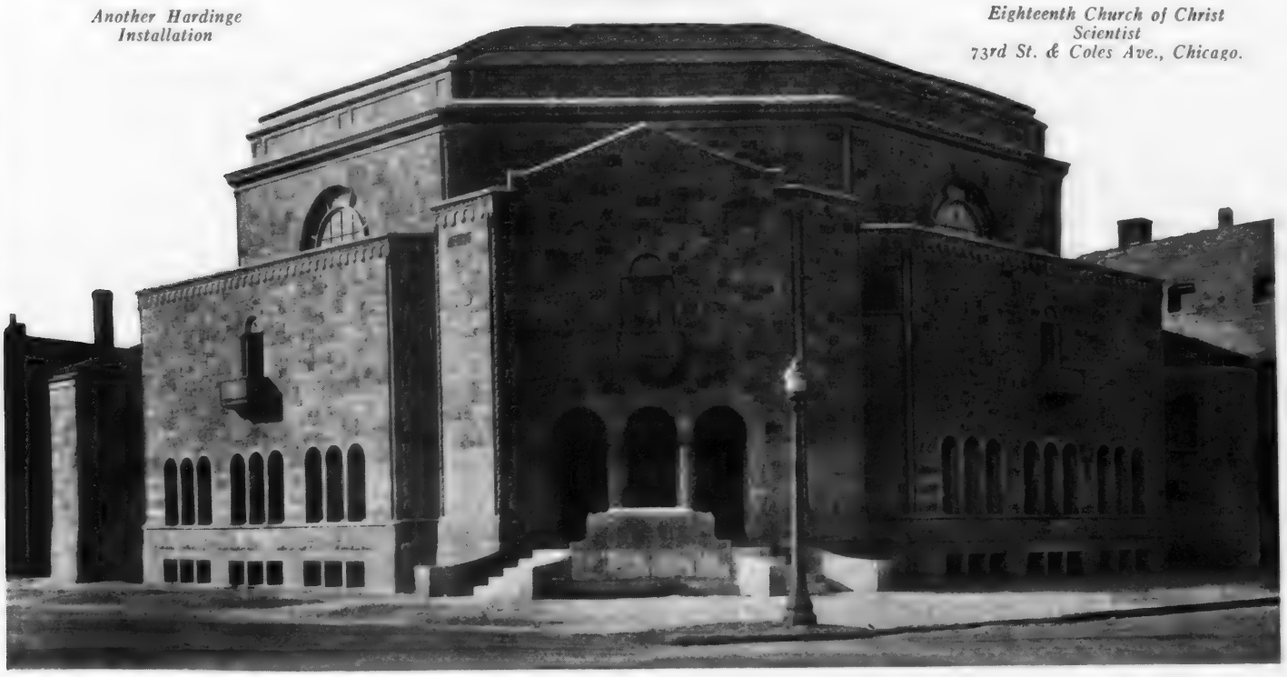
CHICAGO
Factory Sales Office
Michigan Ave. at Ohio St.

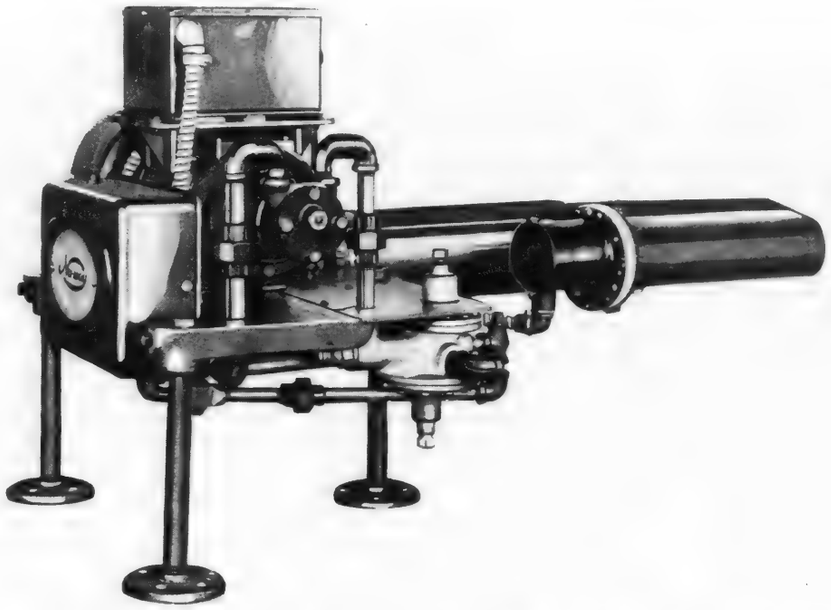
Factory and General Offices:
4149 Ravenswood Avenue
CHICAGO

BOSTON
Factory Sales Office
843 Beacon Street

Another Hardinge Installation

Eighteenth Church of Christ Scientist
73rd St. & Coles Ave., Chicago.





You will have 6 New Sales Features to show your prospects if you show them

AUTOMATIC OIL BURNER

Nu-way

FOR HOME HEATING

Automatic Oil Burners

The 1928 Nu-way

Is More Quiet. A quiet fire has been developed that eliminates all flame roar.

Has No Extra Pump. The supply pump is now part of the burner and already installed on the unit. Both cost and installation work of an extra pump eliminated.

Is Built in a Single Unit. The controls and the supply pump both formerly extra units are now built into a single unit—a much more simple and efficient construction.

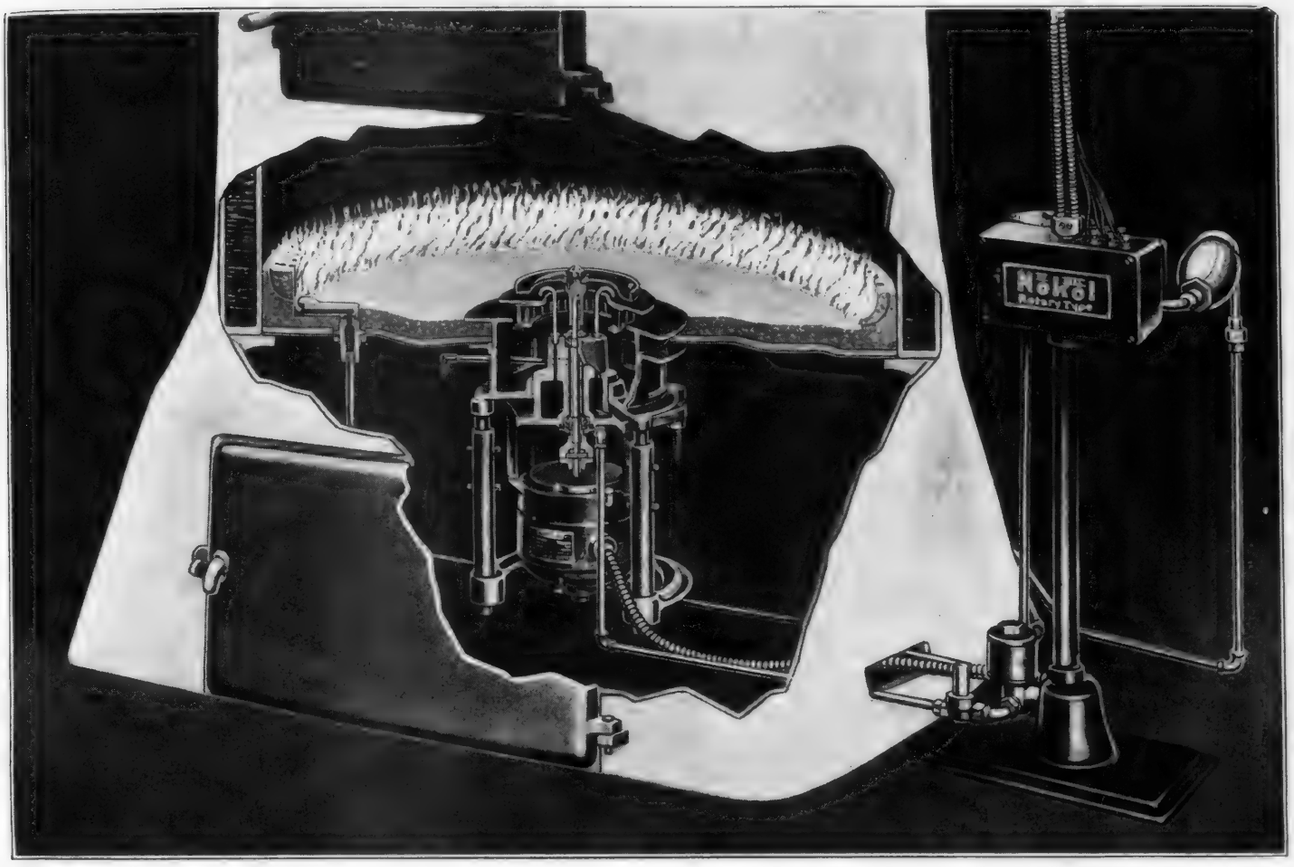
Has A Constant Fire Size that is not affected by a change in fuel.

Burns Less Oil. Improved combustion makes a hotter fire and heats more quickly.

Control of Atomizer Pressure greatly simplified.

Write for Prices and Terms.

The Nu-way Corporation, Rock Island, Ill.



NEW PROFITS FOR DEALERS

DEALERS everywhere are telling us of the *increased profits* made possible by tremendous public demand for the new Rotary-Type Noiseless Nokol. As many have pointed out, this remarkable product supplies a market never before covered by any burner.

Its attractive low price . . . quietness . . . ease of installation . . . and simplicity of operation, are some of the points that have won *instant popularity*, from both home-owners and Dealers, for the Rotary-Type burner.

With a line that ranges from the smallest Nokol to the largest Aetna, Nokol Dealers are equipped to make installations in every size and type of building . . . They can provide efficient service for every heating need.

Details of the increased profit opportunities of our 1928 Sales Plan gladly mailed you, upon request.

AMERICAN NOKOL CORPORATION

4223 SCHUBERT AVENUE, CHICAGO

World's Oldest and Soundest Automatic Oil Burner Maker

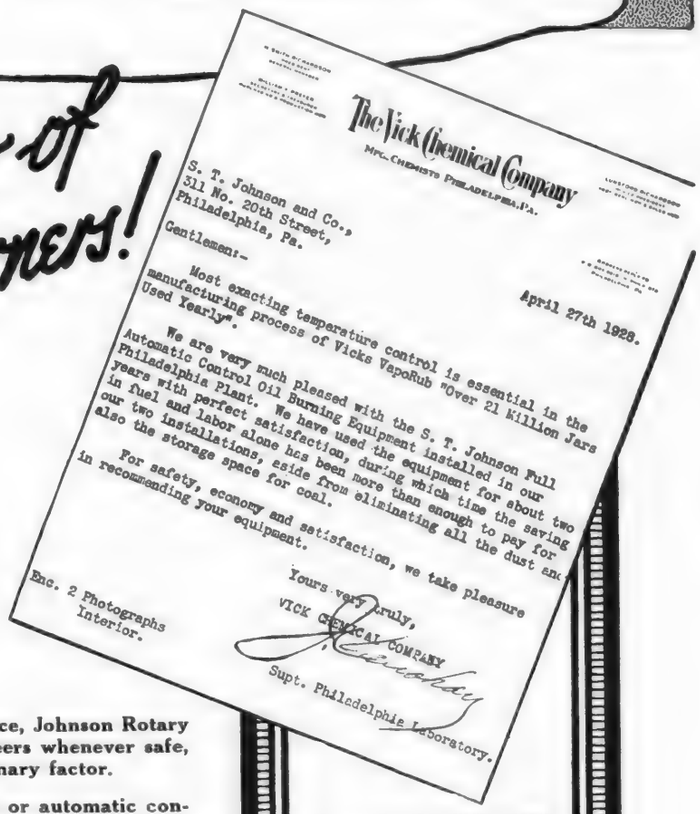
NEW Noiseless NO COAL Nokol

REG. U.S. PAT. OFF.

CLEAN AUTOMATIC OIL HEAT

The saving in fuel and labor alone has been more than enough to pay for our two installations.

Says one user of Johnson Oil burners!



The Vick Chemical Company
MFG. CHEMISTS PHILADELPHIA, PA.

S. T. Johnson and Co.,
311 No. 20th Street,
Philadelphia, Pa.

April 27th 1928.

Gentlemen-

Most exacting temperature control is essential in the manufacturing process of Vicks VapoRub "Over 21 Million Jars Used Yearly".

We are very much pleased with the S. T. Johnson Full Automatic Control Oil Burning Equipment installed in our Philadelphia Plant. We have used the equipment for about two years with perfect satisfaction, during which time the saving in fuel and labor alone has been more than enough to pay for our two installations, aside from eliminating all the dust and also the storage space for coal.

For safety, economy and satisfaction, we take pleasure in recommending your equipment.

Yours very truly,
VICK CHEMICAL COMPANY
Supt. Philadelphia Laboratory.

Enc. 2 Photographs
Interior.

The Vick Chemical Company's plant is typical of hundreds of buildings—ranging from small homes to New York business structures and industrial plants that are economically, cleanly and dependably heated with Johnson Rotary Burners.

The experience of more than twenty-three years as exclusive manufacturers of oil burning equipment, is the explanation of Johnson superiority. Combining simplicity with perfection of design and performance, Johnson Rotary Burners are the choice of architects and engineers whenever safe, economical, dependable heat or power is a primary factor.

Johnson Rotary Burners, with either manual or automatic control, are made in five sizes—giving a range of from 250 to 27,800 square feet of steam radiation or its equivalent.

In addition to our Rotary Burners, we manufacture low pressure oil burners and pumping equipment, steam atomizing, natural draft and whirlwind burners, crude oil pumps, also electric or steam driven oil pumping and pre-heating equipment.

An Engineering Service is maintained for the use of heating and ventilating men, for architects, for anyone with heating problems. The accumulated data of a score of years is at your disposal.

FOR PROSPECTIVE DEALERS we have an interesting story. You are urged to write for information.

A partial list of uses for which there are one or more scientifically designed Johnson Burners;

Industrial Plants
Department Stores
Public Buildings
Office Buildings
Apartments
Bungalows
Residences
Hospitals
Churches
Libraries
Factories
Theaters
Garages
Schools
Hotels
Banks
Clubs

Johnson Rotary Burners are approved by the New York Board of Standards, the Underwriters Laboratory, and fire prevention bureaus everywhere.

MEMBER OIL HEATING INSTITUTE
OIL HEAT
AS BENEVOLENT AS SUNSHINE

S. T. JOHNSON CO.

Manufacturers of Oil Burning Equipment

For Every Heating and Power Purpose

Main Office and Factory; 949 Arlington Avenue, Oakland, California
Branch Factories: San Francisco · Stockton · Sacramento · Philadelphia

YOU WILL FIND OUR LOCAL REPRESENTATIVE'S ADDRESS IN YOUR TELEPHONE DIRECTORY

Dependable OIL HEAT *for Buildings of all Types and Sizes*

ELECTROL automatic oil heat is as practical for apartments, churches, schools, libraries, banks and stores, as it is for private homes. Buildings of every type and practically every size are being successfully heated with Electrol Automatic Oil Burners.

Here is modern automatic oil heat *at its best*. Quiet..All-Electric..Entirely Automatic..Providing the comfort of an unvarying temperature, with unequalled convenience and the saving of all manual labor. And governed in every phase of its economical operation by the positive automatic supervision of The Master Control, an exclusive device built integral with the burner, which stands watch day and night like a living sentinel regulating the flow of the oil, timing the ignition, governing combustion.

KNOW ELECTROL BY THE BUILDINGS IT HEATS

The illustrations shown here indicate the wide variety of types and sizes of buildings which are being successfully heated by Electrol, emphasizing its desirability whatever the heating requirements may be. Electrol operates with high efficiency in any type of heating plant.

A good burner to recommend, —A good burner to sell

When heating and ventilating engineers recommend Electrol, they can do so with the assurance that their professional reputations will be backed by correct installation. Dealers' installation men are thoroughly trained by the factory in the correct methods of fitting Electrol to every type of heating plant. Likewise, you have the double assurance of dependable operation right from the start because Electrol burners are received by the dealers completely assembled just as they were when subjected to their final test at the factory. As Electrol dealers, heating and ventilating men will enjoy the benefits of factory help and experience in many ways. Your installation and service men will be trained by the factory. You will receive full co-operation in establishing the complete automatic oil heating service which characterizes Electrol dealers everywhere.

The Sales Plan is a Step Ahead

You will secure the advantages of a sales plan which is a step ahead of anything you've heard of in oil burner selling. Built as a result of long and intensive research in many sections of the country, the Electrol sales plan provides dealers with a powerful selling punch.

In addition, your local sales efforts are re-inforced by advertising in national magazines which reach people in every community who have the means to buy oil burners.

Send for complete details of this finer oil burner. In writing, please state if you are interested in Electrol for dealer representation, and we shall be glad to discuss the opportunities of the Electrol Franchise in your city.

Opportunity for Dealers:
The Electrol Franchise affords a valuable opportunity to make money selling oil burners. May we explain?

ELECTROL

The OIL BURNER with *The Master Control*

Listed as Standard by the Underwriters' Laboratories, and bears their label

Member of the Oil Heating Institute

Electrol Inc. *of* Missouri,
177 Dorcas St., St. Louis.

Gentlemen: Please send complete details of Electrol Oil Burner. I want the information for my files ☐. I am interested in dealer representation ☐.

Name .....

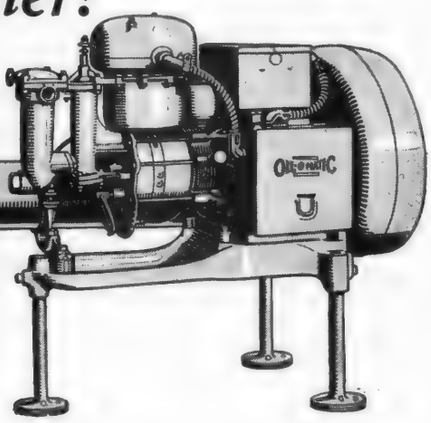
Address .....

City ..... State .....

Williams Oil-O-Matic Dealers aren't all super-salesmen... then why are more homes heated by Oil-O-Matic than by any other oil burner?

It must be THE Burner!

New Model J



SIMPLER, quieter, more efficient, needs less service attention. Any wonder the new improved model "J" Williams Oil-O-Matic dealer organization is growing daily, while sales are mounting swiftly?

Strong advertising help—a nationally famous name—a still finer product—whole-hearted factory co-operation—isn't that your idea of an ideal connection for any dealer to make?

A new development, announced to Williams Oil-O-Matic dealers at the Fourth International Williams Oil-O-Matic Sales Convention at Bloomington in June, removes the last obstacle to selling oil heating to *every* home owner. Let us tell you about it!

WILLIAMS OIL-O-MATIC HEATING

WILLIAMS OIL-O-MATIC HEATING CORPORATION

Bloomington, Illinois

WILLIAMS OIL-O-MATIC HEATING CORP. H.V.-7-8
BLOOMINGTON, ILLINOIS
Please send me full information on the Williams franchise

Name.....

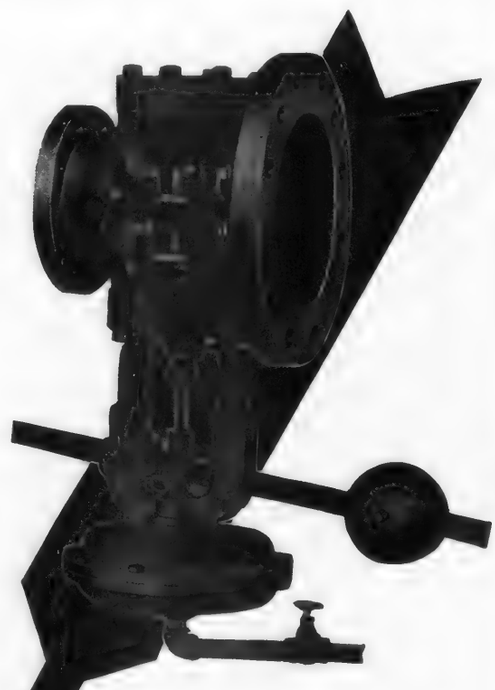
Street Address.....

City.....

State.....

See page 57
for announcement of extreme importance to every member of the heating profession

McALEAR SCORES AGAIN!!



The efficiency of a line of Reducing Valves, Steam Traps and other steam specialties cannot be doubted when that line has been installed in

THE STEVENS HOTEL, CHICAGO

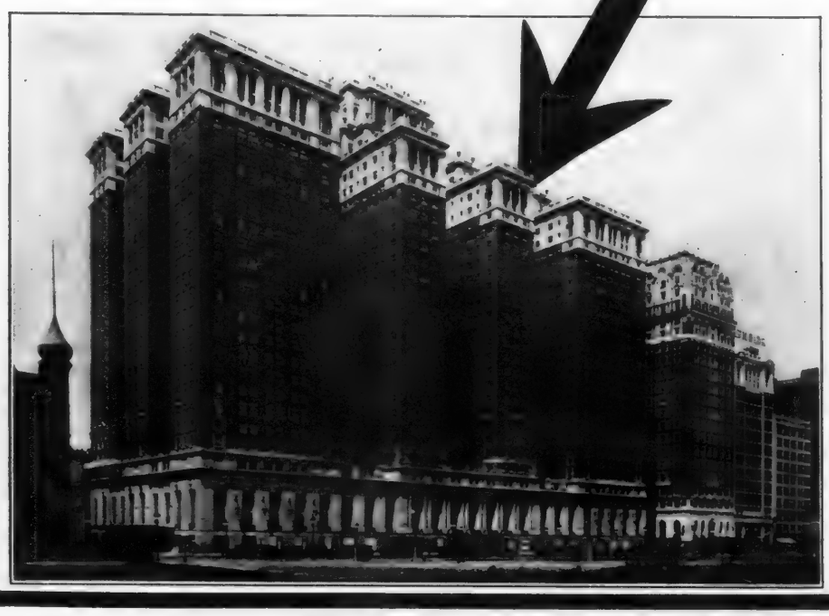
The world's largest hotel.

The heavy and constant duty imposed on any specialties installed in a hotel such as this, requires that they at all times give the best performance.

This distinction is enjoyed by The McAlear Mfg. Co., whose line of steam specialties is complete and has a reputation of fulfilling all requirements demanded of them.

This is another of a long list of installations in which McAlear quality and performance was the deciding factor.

STEVENS HOTEL, CHICAGO, ILL.
Holabird & Roche, Architects, Chicago.
Phillips Getchow & Co., Heating and Power Contractors, Chicago.



McALEAR No. 155
Pressure Reducing Valve

This valve is one of the many types used in this building, for reducing from the high initial pressure to low reduced pressure for heating service. There is a McALEAR Reducing Valve which will meet any operating condition required—from initial pressure of 5 lbs. to 250 lbs., down to any reduced pressure as low as a few ounces, or even a partial vacuum.

Send for Catalog No. 28

Many leading architects, engineers and contractors are specifying and using McAlear power and heating specialties. They use this 128-page catalog as a hand book for their engineers. It contains not only descriptions of the articles manufactured, but charts, diagrams, tables, and much helpful information for specifying and installing the proper equipment. A copy should be on your desk. If you do not have one, write today.

19th and Western

McALEAR
Manufacturing Company

Chicago, Illinois

Nowhere else can you find

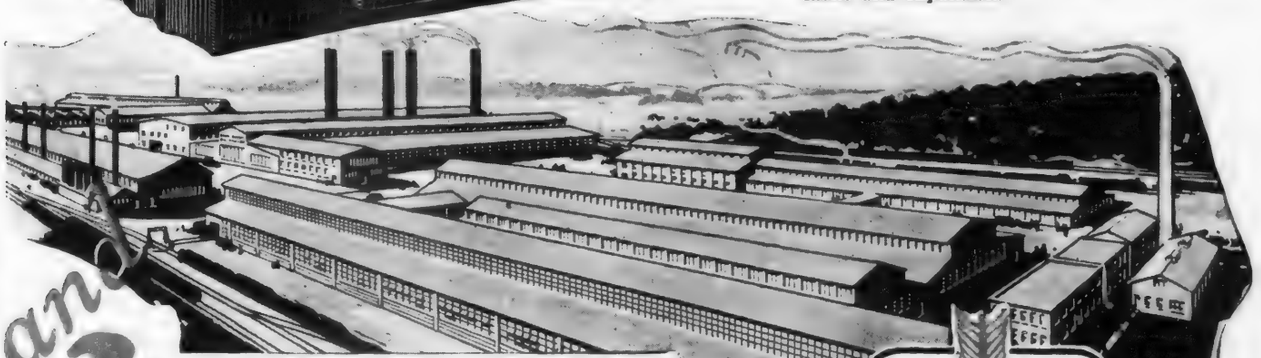
3 such advantages as Newport offers

1 FAMOUS BOILER — —

The public knows Newport: is sold on Newport: is buying Newport. Sales have increased 400 percent during the last five years. -:- -:-

2 FACILITIES — —

Newport manufacturing facilities are vast and efficient, adequately providing for maintenance of quality, prompt deliveries, future development and expansion.

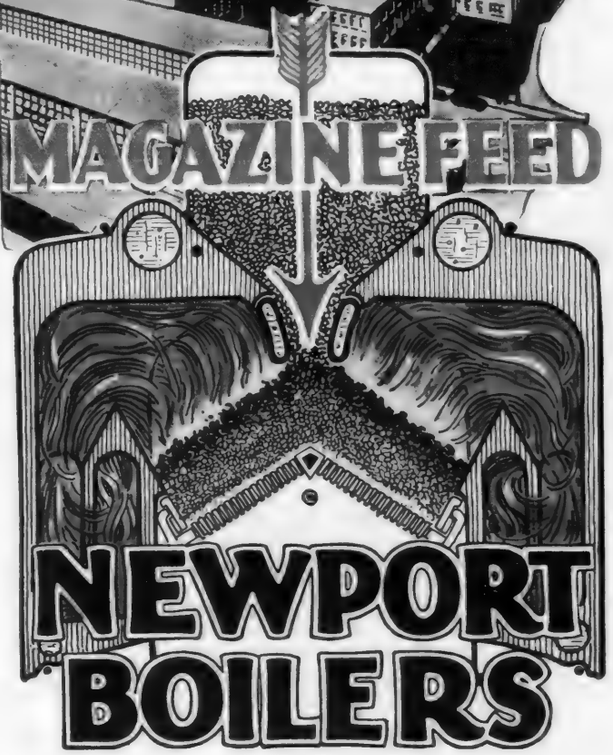


and 3 A FEATURE THAT Puts You Above Competition

The home owner appreciates the service, the convenience, the economy of Newport, directly resulting from its magazine feed principle.

Get back of this magazine feed idea — sell it — it is different — has real popular appeal. It will get you bigger and better contracts at satisfactory profits — give your customers satisfaction that makes boosters of them.

Let us tell you *How* to talk Magazine Feed. Just drop us a line — let us know you are interested. We will send you full information — without obligation — also our valuable *free* booklet, "The Practice of Scientific Heating."



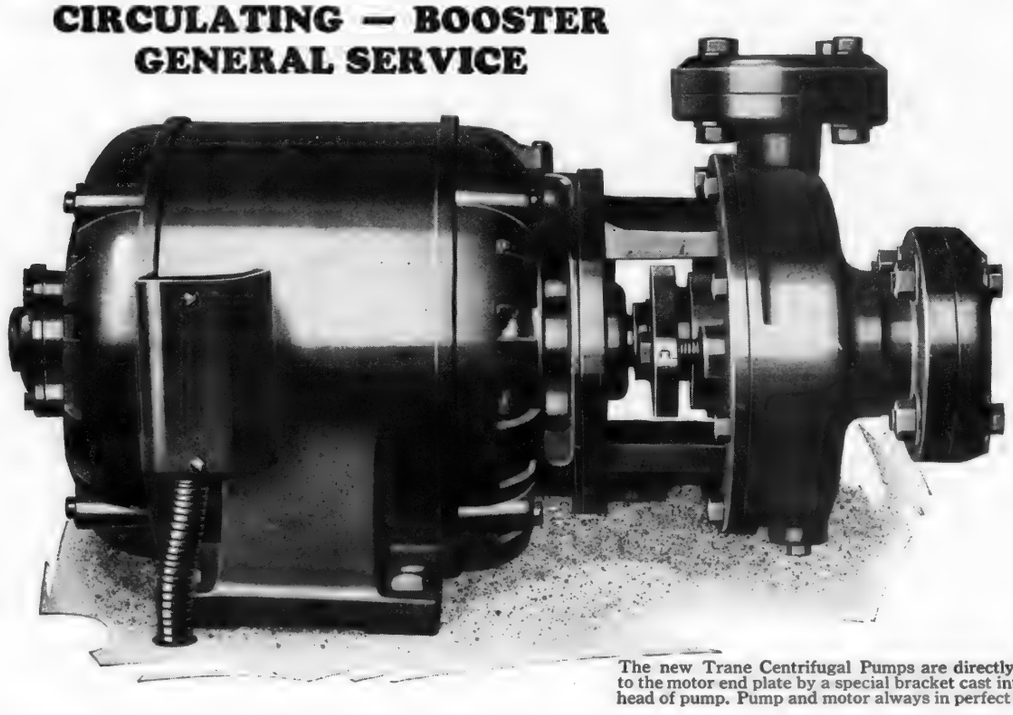
NEWPORT BOILER COMPANY
(Division of Hart-Parr Company)
GENERAL OFFICES
529 South Franklin Street -:- Chicago, Illinois
Distributors in all principal cities of the United States and Canada
15 Successful Years -:- -:- Exclusive Patented Features
Unlimited Manufacturing and Distributing Facilities

Save 30% to 50% on Fuel — Burn No. 1 Buckwheat Coal

Trane Announces—

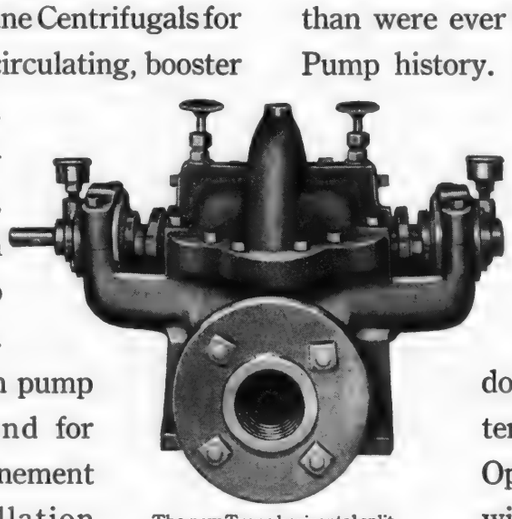
Improved Line of Centrifugal Pumps

BOILER FEED — CONDENSATION
CIRCULATING — BOOSTER
GENERAL SERVICE



The new Trane Centrifugal Pumps are directly connected to the motor end plate by a special bracket cast integral with head of pump. Pump and motor always in perfect alignment.

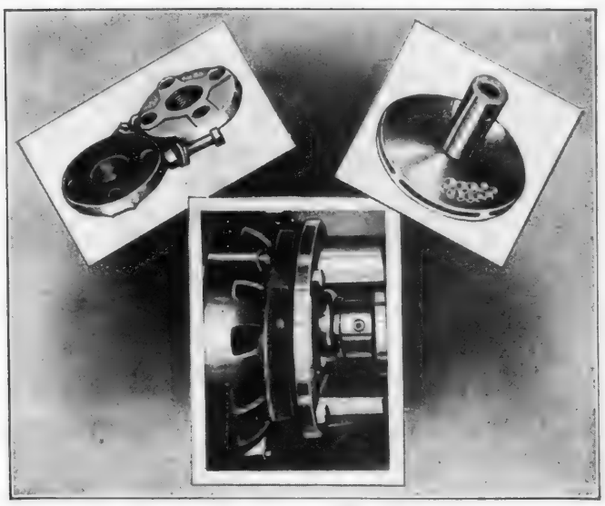
A Complete New Line of Centrifugal Pumps! Increased Capacities! Higher Efficiency! More Compact Units! Easier to Install! Completely Assembled! Nothing Extra to Buy! One-Man Installation! All of these features and many others are built into the new line of Trane Centrifugals for boiler feed, condensation, circulating, booster and general service work. Quiet in operation. Comparatively light in weight, yet sturdy in construction to enable them to stand up as they should in service. Fifteen years' experience in pump building is the background for these new units. Every refinement that will make the installation easier and increase the service of the pump has been included. Higher efficiencies have been obtained in these new units than were ever before secured in Centrifugal Pump history. On the smaller pumps three-quarters horsepower motors do work that has required one or one and one-half horsepower in the past. On the larger pumps, seven and one-half horsepower motors do work that has always required ten. Capacities are surprising. Operation costs are lower. And with all these features the prices are still low. Send for new bulletins containing complete information on this improved line of pumps at once.



The new Trane horizontal split shell centrifugal pump for booster, circulating and boiler feed service

This is No. 2 of a series of three announcements on new Trane equipment. Announcement No. 1, on the new Under-Window Type Concealed Heater appeared in the June issue of this paper. The Third will appear in an early issue.

Simple Construction

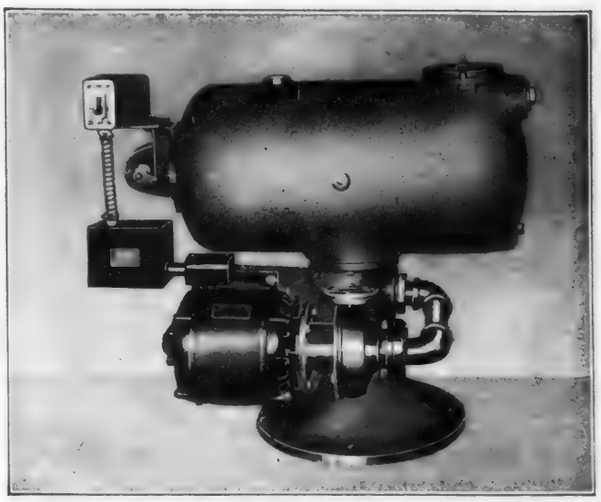


Upper Left—Companion Flanges for Inlet and Outlet furnished as part of pump. Upper Right—Trane pump impellers are perfectly balanced to eliminate vibration. Center—Close up view showing method of connecting pump with motor.

The new Trane Pumps are designed for simplicity of installation and maintenance and for long life. Every feature that would simplify these pumps and yet improve them has been incorporated. Impellers are carefully balanced to eliminate vibration. All bearing housings are fitted with double row of New Departure ball bearings. Pumps are bronze fitted throughout to prevent corrosion.

Shafts are of high carbon steel and oversize. Stuffing boxes have split gland — repacking easy. Also fitted with recess to collect leakage. No water can get to bearings. Companion flanges are furnished for both inlet and outlet. A special end plate on the motor is connected directly to the pump suspension bracket which is cast integrally with the pump head. Pump and motor always in alignment. No couplings. Pump impeller direct connected to motor shaft. Easy to clean—take out eight screws and the head comes off.

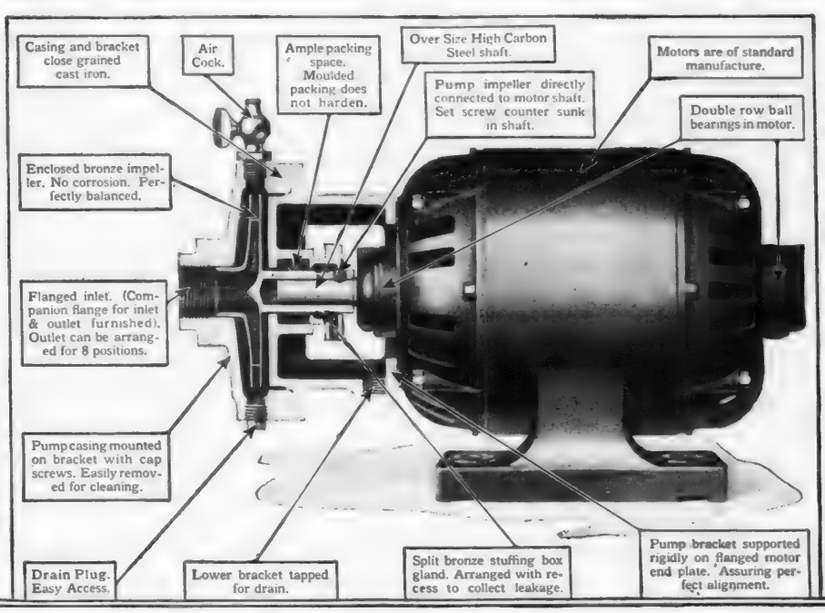
Ready to Install



Trane condensation pumps are furnished completely assembled and wired for installation. Pump, Motor, Receiver, Switch Box, and Motor Protective Equipment mounted as a single unit on one base.

The new line of Trane Centrifugals when used as condensation pumps are furnished completely assembled, ready to hook up.

The receiver, pump, motor, switch box, and motor protective equipment are all mounted as a single unit. Nothing extra to buy. Everything is furnished including flanges on suction and discharge.


Casing and bracket close grained cast iron.
Air Cock.
Ample packing space. Moulded packing does not harden.
Over Size High Carbon Steel shaft.
Motors are of standard manufacture.
Pump impeller directly connected to motor shaft. Set screw counter sunk in shaft.
Double row ball bearings in motor.
Enclosed bronze impeller. No corrosion. Perfectly balanced.
Flanged inlet. (Companion flange for inlet & outlet furnished). Outlet can be arranged for 8 positions.
Pump casing mounted on bracket with cap screws. Easily removed for cleaning.
Drain Plug. Easy Access.
Lower bracket tapped for drain.
Split bronze stuffing box gland. Arranged with recess to collect leakage.
Pump bracket supported rigidly on flanged motor end plate. Assuring perfect alignment.

One man makes the entire installation. Two piping connections are all that is required. Outfit is completely wired to meet national code requirements. Switch box and motor protective device furnished as standard equipment.

The new Trane Condensation Pump Units are available for capacities up to 500 gallons per minute and for pressures up to 225 pounds.

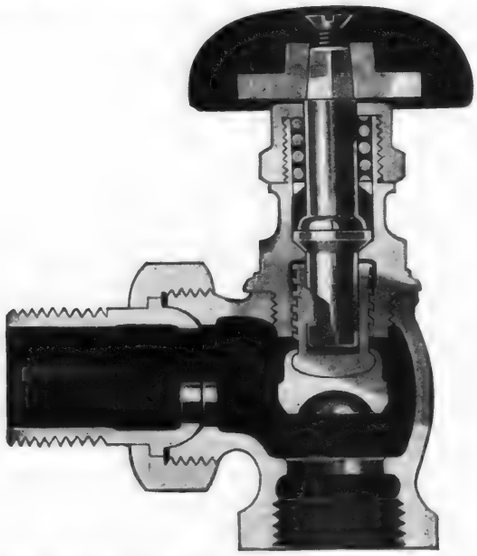
Cutaway view of the new Trane Centrifugal Note the simple construction.

The Trane Company . . La Crosse, Wisconsin

206 Cameron Avenue

Vapor and Vacuum Heating Specialties, Heat Cabinets, Pumps, Unit and Blast Heaters

Marsh Re-enforced PACKLESS WATER Radiator Valves



Oval Wheel
or
Lock Shield

Fig. 137

These valves are quick opening, full pipe capacity, and are GUARANTEED NOT TO STICK AT ANY TIME, OR LEAK AT ANY PRESSURE that a cast iron boiler and radiation will stand.

We believe they are the only Packless valves which will hold high pressure forced circulation and also protect against taking in of air around stem in a sealed system, *two very necessary requirements* for satisfactory service and cost no more than the cheap competition valves. Get our prices.

Marsh Re-enforced GRADUATED WATER Radiator Valves

Fig. 139

Oval Wheel,
Lever Handle
or
Lock Shield

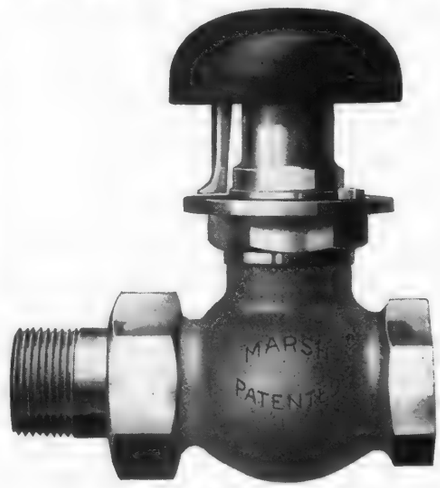


Fig. 239

With these GRADUATED Valves we regulate water heat temperature THROUGH VALVE, the same as for a vapor or vacuum steam system through a Modulating Valve. These are not only of material value for residence service, but we have thousands in use for high pressure service in schools, hospitals and public buildings.

These valves cost but little more than our regular water valves and much less than steam modulated valves.

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

General Sale Distributors

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Appleton & Liptrott, Inc.
1480 Broadway, New York

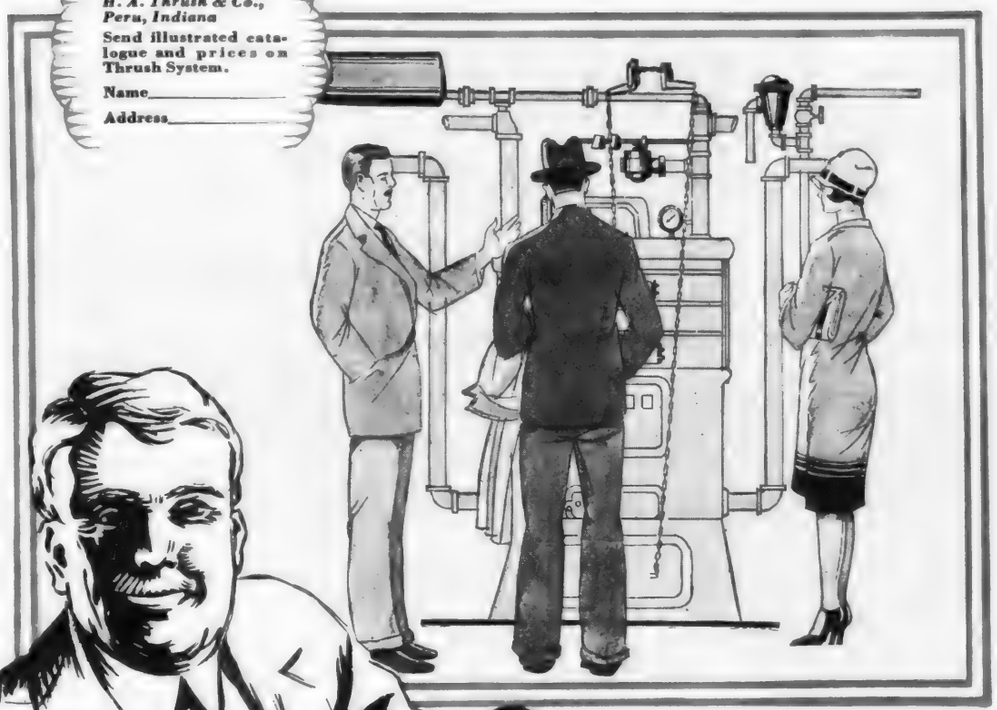
John W. Mabbs
431 So. Dearborn St., Chicago, Ill.

United States Radiator Corp'n
General Offices: Detroit, Mich.

SARCO COMPANY, Inc.
183 Madison Ave., New York

Taylor-Forbes Company
Canadian Agents Guelph, Ont.

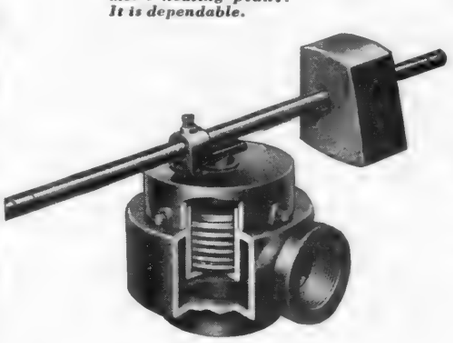
MAIL NOW
H. A. Thrush & Co., Peru, Indiana
Send illustrated catalogue and prices on Thrush System.
Name_____
Address_____



"They're working for me telling their friends about Thrush System"

Safe!

Your reputation is safe when you have installed Thrush Equipment on your customer's heating plant. It is dependable.

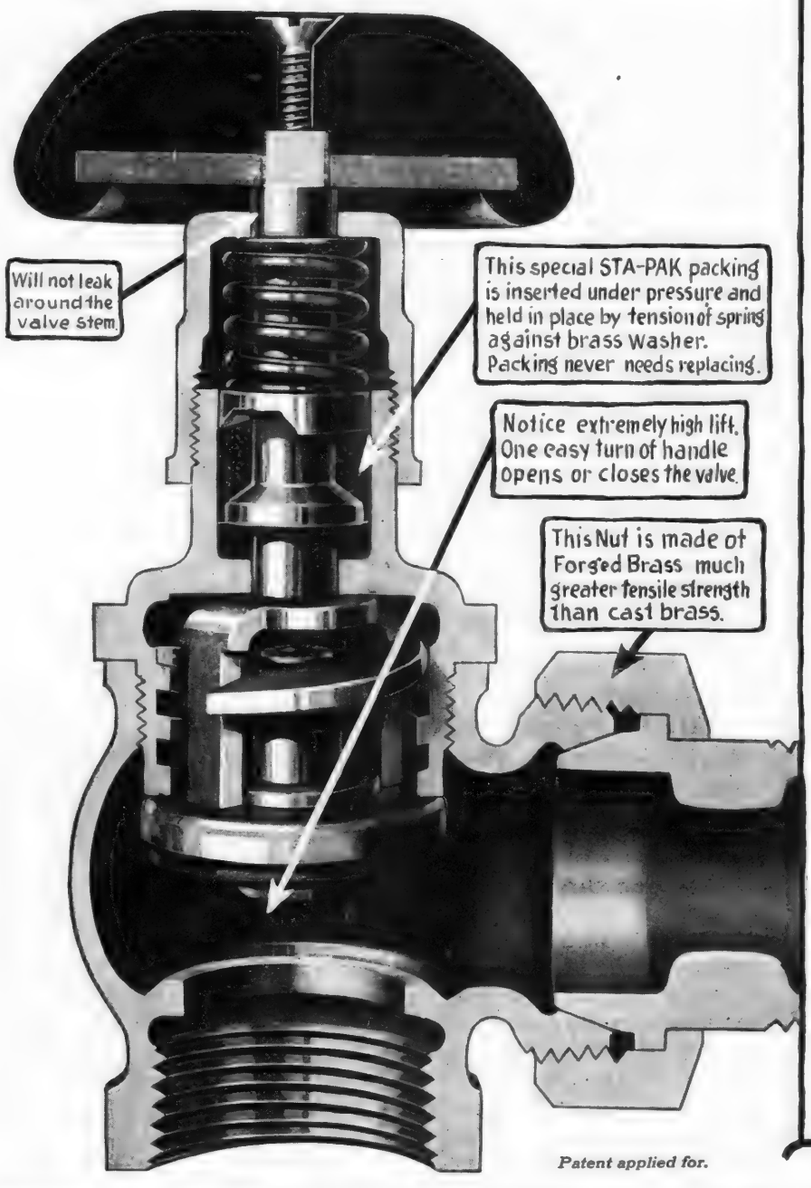


THERE'S a lot of solid satisfaction in knowing that you have given your customer the best—a Hot Water Heating Plant, Thrush Equipped. And it's good business too! When a satisfied customer thinks enough of his heating plant to take his guests to the basement to tell them about it, he's going to give you a real boost and your business is going to grow. Thrush Equipment makes the job so much more efficient and satisfying that your customers will do that very thing. Specify Hot Water Heat, Thrush Equipped, on every job.

H. A. THRUSH & CO.
Peru, Indiana

THRUSH SYSTEM
OF HOT WATER HEATING

"Yes! Use STA-PAK Valves on those 'ONE-PIPE' Steam Jobs, too!"


Will not leak around the valve stem.
This special STA-PAK packing is inserted under pressure and held in place by tension of spring against brass washer. Packing never needs replacing.
Notice extremely high lift. One easy turn of handle opens or closes the valve.
This Nut is made of Forged Brass much greater tensile strength than cast brass.

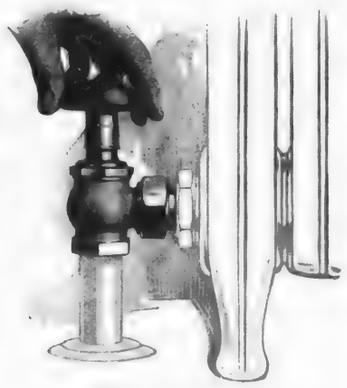
Patent applied for.

Two very important requirements of a valve for use on one pipe jobs are that it must not leak around the stem and it must have sufficient lift to allow for return of condensed steam.

STA-PAK VALVES

never need re-packing

Because of the special packing which is inserted under pressure, no packing replacement is ever required and this feature makes the Sta-Pak absolutely leak-proof. Furthermore, the lift of a Sta-Pak is two and one half times greater than actually required for one pipe jobs. The cost is but little more than charged for ordinary valves, while the customer satisfaction is incomparable—use Sta-Pak valves on one pipe work and on every other type of steam job.



Wholesalers:
Sta-Pak valves assure customer satisfaction and allow you a liberal margin. Write for details.

CAPITOL BRASS WORKS

DIVISION OF MICHIGAN SMELTING & REFINING COMPANY

MANUFACTURERS OF BRASS VALVES, BOILER TRIMMINGS AND PLUMBERS' BRASS GOODS

DETROIT, MICH.

Mercoid Thermostat
Fig. 21

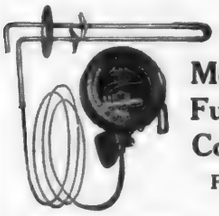
For automatic control of oil burners, unit heaters, and other applications where it is desired to control an electric circuit through changes in temperature.

Mercoid Pressure Control
Fig. 31

A positive safety limiting device for all steam units. Widely used as a boiler control with automatic oil burners and automatic coal-burning equipment.

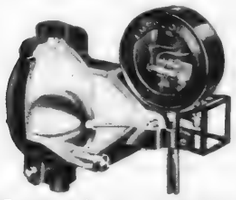
Mercoid Immersion Type Control
Fig. 36

An unfailing automatic limiting device for control of motor-driven units on hot water boiler installations. Fig. 37 is particularly adapted for positive control on vapor-vacuum systems.



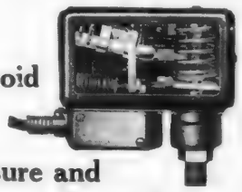
Mercoid Furnace Control
Fig. 50

For warm air furnaces. A positive safety device to prevent overheating.



Mercoid Low Water and Pressure Control
Fig. 71

Prevents firing into a dry boiler or building up excess pressure. A certain protection for automatically-fired steam boilers.

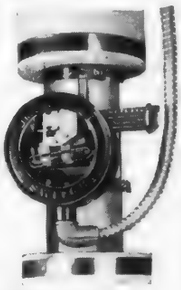


Mercoid Pressure and Vacuum Control
Mod. 848

Recommended for conditions where it is desired to maintain a close operating differential over a wide range—with double adjustment feature for regulating the cut-in and cut-out points.

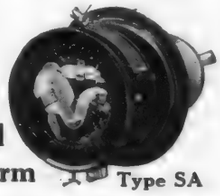
Mercoid Visaflame
Type L

Designed to guard unfailingly against hazardous conditions which may result from failure of flame or ignition. This control allows the burner to operate only in the presence of actual visible light from the flame, even though incandescent conditions exist in the combustion chamber following flame failure.



Mercoid Risertherm
Fig. 35

For external temperature adjustment. One type fits either horizontal or vertical pipe. Fits any pipe or hot water tank. Positive snap action. Simply adjusted.



Mercoid Pyratherm **Type SA**

For flue installation where stack temperature is in excess of 200° F. and not above 1100° F. No metal or moving parts in the stack. Furnishes dependable protection against hazardous conditions which may result from flame or ignition failure.

Mercoid Adjustatherm
Type S

For safety trip-off operation in connection with the Mercoid Type L Visaflame, designed for mounting directly on the oil burner. At time of installation, the only adjustment necessary is setting the predetermined period for cut-off.

for every requirement of the industry

Illustrated on this page are a few of the complete line of Mercoid Controls for heating equipment.

The design and construction of Mercoid controls insure ease of installation and highly satisfactory performance, with freedom from service expense and replacements.

Mercoid controls are designed for automatic or semi-automatic direct control of motors where the normal working load does not exceed 10 amperes at 110 volts or 5 amperes at 220 volts, A.C. or D.C. As a pilot switch where used in series with the proper starting switch, the Mercoid will automatically control motors of the largest size. No transformers are required for voltages up to 220.

There is a Mercoid control for every phase of automatic heating. If you are not already familiar with Mercoids, write us and we will gladly explain any feature in which you may be especially interested. We will also send you our large illustrated catalogue, describing the complete line.

The Mercoid Corp.

564 West Adams St., Chicago, Ill.
25 Church St., New York, N. Y.

St. Otto Orphanage,
St. Cloud, Minn.

Architect
Victor Cordella, A.I.A.
Minn.

Airplane View

FROM BOILERS TO FARTHEST RADIATORS

10 Buildings—18,000 Sq. Ft. of Radiation
One Central Boiler Plant—Unit Ventilation

and the

O-E 3-IN-1 HEATING SYSTEM

Entire System Operating by Gravity—Complete Circulation on Less Than Ounce Pressure

No Vacuum Pumps
No Condensation Pumps
No Receivers
No Tilting Tanks
No Equalizing Devices
or Like Complicated
Mechanisms Required
Single or Group Buildings
O-E Renders the Maximum
in Heating Efficiency
None too Large
None too Small

MORE HEAT—LESS FUEL

O-E SPECIALTY MFG. CO.

12 Keefe Avenue **Milwaukee, Wis.**

BRANCHES:—O-E Specialty Mfg. Co., 7054 Willoughby Ave., Los Angeles, Calif., L. W. Stierlin, Mgr. 635 Mission St., San Francisco, Calif., C. U. Martin, Mgr. 235 Stark St., Portland, Oregon, R. H. Griffith, Mgr. Bessemer Bldg., Pittsburgh, Pa., G. G. Semans, Mgr. 329 Moore Bldg., San Antonio, Texas, Wilton F. Rose, Mgr. 9 Keely Bldg., Denver, Colo., John A. Lungstrum, Mgr. Daylight Bldg., Knoxville, Tenn., J. A. Ahler, Mgr.

TRADE OE MARK

Mr. WM. GALENA
HEATING CONTRACTOR

States that after installing this and many other OE Systems that he is so convinced of the efficiency and economy of the OE 3-IN-1 System that he is willing to install an OE job, accepting a small initial payment, the balance to be derived from a part of the saving effected in the consumption of fuel.

LEADERS IN SEAMLESS TUBING

Copper, Aluminum, Brass

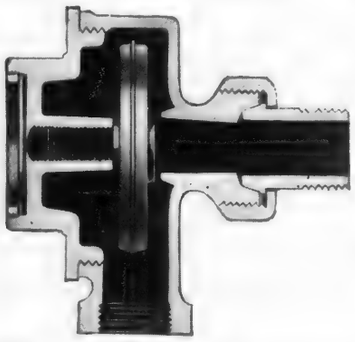
In a few short years this company has won leadership in the field of small diameter seamless tubing and tubing products—random lengths, random length coils; soldering lugs, engine oil lines, heater units and other fabricated specialties. Over five acres of factory—operated with unprecedented efficiency.

WOLVERINE TUBE CO.

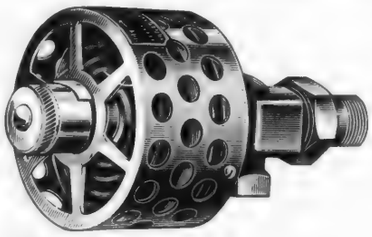
SEAMLESS COPPER BRASS & ALUMINUM

1415 Central Ave., Detroit, Michigan

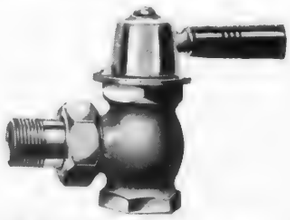
Sales Offices: Cleveland; Chicago; Atlanta; Los Angeles; Denver; Rochester, N. Y.; Dayton, Ohio; New York City; Dallas, Texas.



Sterlco TRADE MARK Thermostatic Trap



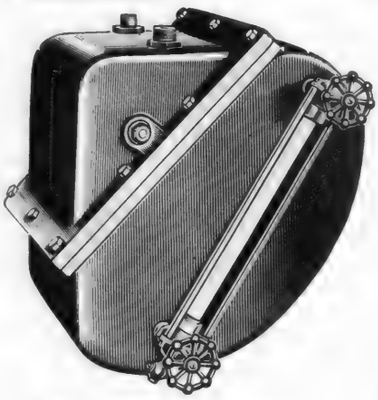
Sterlco TRADE MARK Roys Thermotrol
(Temperature Regulating Valve)



Sterlco TRADE MARK Radiator Valve

Sterlco TRADE MARK Air Eliminator

Sterlco TRADE MARK Unit Heater Trap

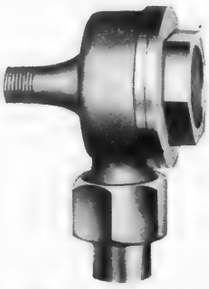


Sterlco TRADE MARK Return Trap

Sterlco TRADE MARK
Heating Specialties

STERLING ENGINEERING CO.
1626-44 Holton Street
Milwaukee, Wis.

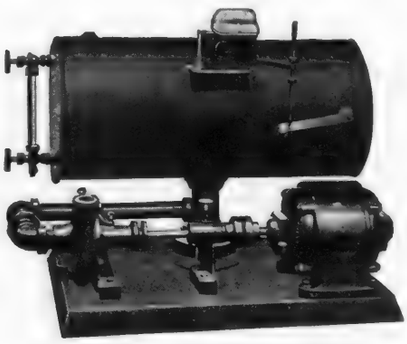
Sales Representatives in all principal cities



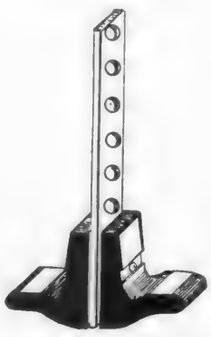
Sterlco TRADE MARK Air Line Valve

Sterlco TRADE MARK Vacu Float Vent

Sterlco TRADE MARK Compeller
(For stimulating water circulation)



Sterlco TRADE MARK Pump and Receiver



Sterlco TRADE MARK Ceiling Radiator Hanger

Why this great welcome?

Wherever the Raymond Duo-Stat has been installed or even demonstrated it has been acclaimed one of the most remarkable aids to automatic gas or oil firing that has yet been developed.

The reason for this is obvious: It has wiped out the two commonest reasons for complaint—(1) Overheating; (2) The chilly condition that engineers have called "cold 70." Note how this has been accomplished:

MOST of your customers have told you, or will tell you, that the only fault of automatic firing is the alternate overheating and chilly condition. In fact, you have probably been told this repeatedly by people whose room thermostats seemed to be working perfectly!

How have you been meeting these complaints?

How will you meet these complaints this fall? Perhaps you have tried to meet them by asking the home owner to reset the boiler limit control in accordance with outside temperature. If so, you were on the right track, but you have probably discovered how impractical such resetting is.

You have waited for weather-compensating control!

But now, for the first time, you have a certain way around these complaints—a way to make dual control *fully* automatic. Think what that means to you in terms of customer satisfaction and in reduced service costs!

What IS the Raymond Duo-Stat?

Reduced to simple terms, the Raymond Duo-Stat compensates the boiler limit for every change in outside temperature—and does this continuously and automatically. As you know, overheating occurs *after* the room thermostat turns the fire off, and the chilly period occurs just before the radiators are again turned on. Only the Duo-Stat prevents these uncomfortable effects.

This booklet tells HOW and WHY . . .

Decide now to get the facts about this new, but tested, device that fulfills a vital need supremely well. You owe your customers or clients this innovation in comfort, and yourself the profit that goes with it. Coupon brings the interesting facts. This is your earliest opportunity to get them.

Coupon brings booklet

F. I. RAYMOND COMPANY
Originators of Automatic Dual Heat Control
RIVER FOREST, ILLINOIS
(Suburb of Chicago)

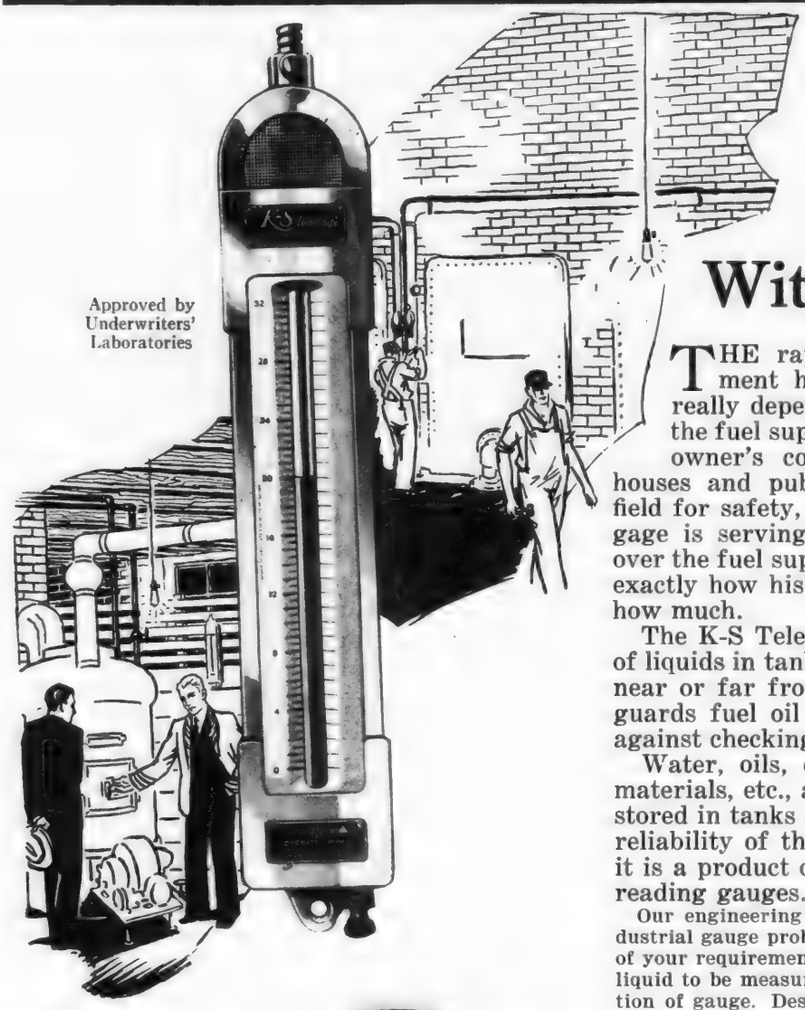
The Raymond DUO-STAT
WEATHER COMPENSATING

If it hasn't a Duo-Stat —it isn't fully automatic

Yes, I want the "How" and "Why" of the Raymond Duo Stat.

Business
Name
Address
Mail to F. I. Raymond Company
River Forest, Ill.

H7



Approved by Underwriters' Laboratories

Never a Tank Without a Telegage

THE rapid development of oil-burner equipment has brought out a crying need for a really dependable distant-reading gauge to guard the fuel supply. In the domestic field for the house owner's convenience, for safety in apartment houses and public buildings,—and in the industrial field for safety, efficiency and economy—the K-S Telegage is serving with notable success, keeping guard over the fuel supply, informing the operator at a glance exactly how his fuel stands, when to order more, and how much.

The K-S Telegage tells at a glance the actual depth of liquids in tanks of any capacity. Placed at any point near or far from the tank, this precision instrument guards fuel oil and all other kinds of liquid storage against checking errors and costly failures.

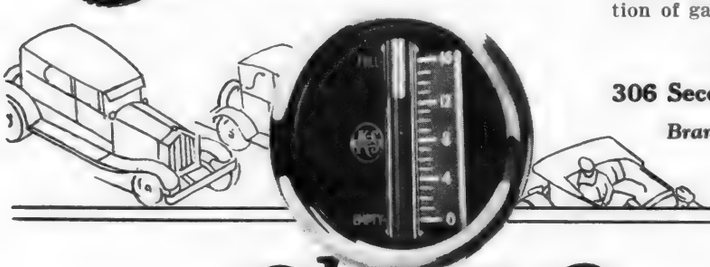
Water, oils, chemicals, gasoline, fuel oil, finishing materials, etc., are a few of the many industrial fluids stored in tanks and guarded by the K-S Telegage. The reliability of the Telegage is assured by the fact that it is a product of the world's largest maker of distant reading gauges.

Our engineering department will be pleased to discuss any industrial gauge problem, if you will write giving a full description of your requirements. Give the Baume or Specific Gravity of each liquid to be measured and the distance from tank to desired location of gauge. Descriptive folder sent on request.

KING-SEELEY CORPORATION

306 Second Street **Ann Arbor, Michigan**

Branch Offices: New York—44 Murray Street
Chicago —472 Wrigley Building



The K-S Telegage

BE CERTAIN WITH THE *K-S TELEGAGE*

Standard factory equipment on three-fourths of all cars selling for $700 or more.

DUNHAM

CONTROLLED BY DEFINITE INFALLIBLE LAWS

Look for the Name
DUNHAM
This nameplate identifies a genuine DUNHAM Radiator Trap

U. S. Patent No. 1644114. Additional patents in the United States, Canada and Foreign Countries now pending.

Over eighty branch and local sales offices in the United States and Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you an any project.

THE Dunham Differential Vacuum Heating System is controlled by laws as definite as the cosmic forces which govern the earth in its journey around the sun, or which cause to function in harmony the millions of stars comprising the "spacious firmament on high."

Natural laws are utilized in this new Dunham Heating System to produce results that hitherto have been unattainable in any type of heating system. Steam at less than atmospheric pressure and at temperatures considerably below the ordinary boiling point of water, provides comfortable, healthful warmth in every room during the milder days which comprise 95% of the heating season. This modified heat input into the rooms works in harmony with nature's law by balancing the heat input and the heat loss. By correctly utilizing this law, fuel waste from overfiring is reduced and the evils of wasteful window opening are eliminated.

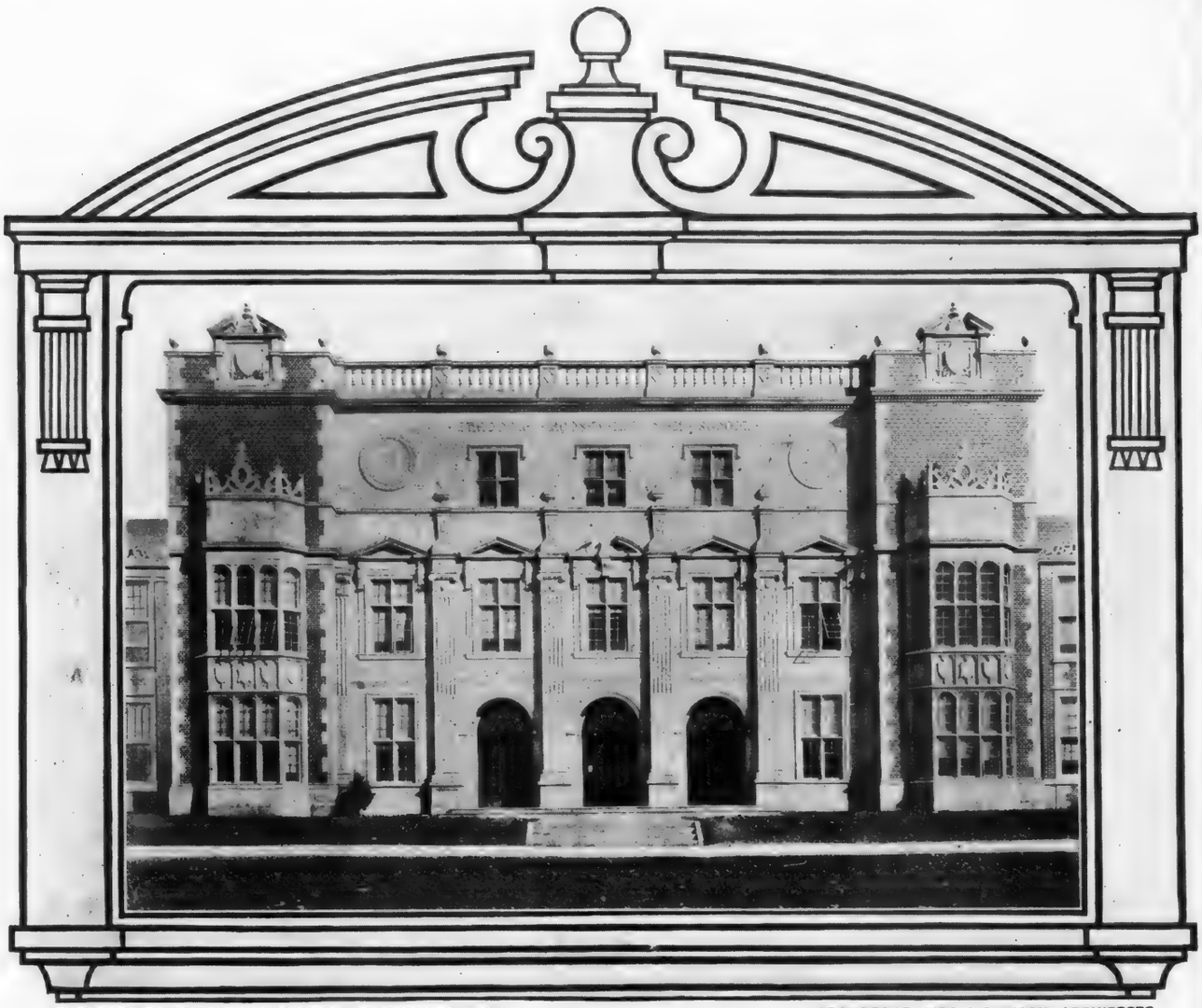
Remarkable fuel economies have been obtained in differing types of installations in various sections of the United States and Canada. For example, in a nine story office building (Chicago) the fuel (oil) cost but $1314.30 for the eight months period from Oct. 1, 1927, to May 31, 1928. A fourteen story apartment building (Chicago) effected a fuel (coal) saving of 295 tons for the heating season of 1926-1927 as compared with 1925-1926, an economy of 27½%. In the manufacturing plant of the Yankee Cake Company, Providence, R. I., during a test period with outdoor temperatures six degrees lower than prevailed when operated as a Vacuum Return Line System, the Dunham Differential Vacuum Heating System produced a fuel saving of 33⅓%.

These facts substantiate the confidence of the nation's leading architects and engineers in specifying Sub-Atmospheric Steam and prove that this new system of heating may well be termed the ultimate in fuel economy, in heating comfort and in satisfaction.

C. A. DUNHAM CO.

DUNHAM BUILDING
450 East Ohio Street, Chicago

HEATING



THEODORE ROOSEVELT HIGH SCHOOL, DES MOINES, IOWA . . . . . PROUDFOOT, BIRD & RAWSON, ARCHITECTS
EQUIPPED WITH JOHNSON HEAT CONTROL

ARCHITECTS are eager to recommend The Johnson System of Heat Control; and they do so with that surety which characterizes the profession. Hundreds have specified Johnson Heat Control, because its results are so unusually significant and totally individual. The common heat waste in a building becomes nil: and fuel costs are actually reduced twenty-five to forty per cent. Constant and unwavering is the service of the all-metal construction of the Johnson System; and despite weather conditions and changes, there is not a faltering moment during its night and day operation. Johnson Heat Control fulfills the architect's real aim and desire for practicability, comfort and economy . . . . which constitute his personal service to his clients.

The Dual Thermostat (Night & Day) Control . . The All Perfect Graduated Intermediate Control

JOHNSON SERVICE COMPANY
MILWAUKEE, WISCONSIN
AUTOMATIC TEMPERATURE REGULATION SINCE 1885
. . . . BRANCHES IN ALL PRINCIPAL CITIES . . . .

JOHNSON · HEAT · CONTROL

"A MAN IS WORTHY OF HIS HIRE"

TO THE HEATING FRATERNITY—

Why have not the sales of radiator heating kept pace with the rapid and enormous growth of the automobile, house refrigerator, washing machine and other industries?

While the sales and marketing problems, facing these and our industry differ very materially, in many respects, I shall touch on only one outstanding difference which should make the answer to the above question obvious to us all.

THERE IS A DIFFERENCE

Because it has been found possible to rapidly build up profitable sales for a flat iron, or some other household article, through house-to-house canvases, by "door-bell ringers", it does not necessarily follow that the same methods would prove profitable, or satisfactory, to a good physician, or attorney, in building up his clientele.

Heating and ventilating is as much of a profession as medicine or law, and the sooner, we, the manufacturers of heating equipment, admit it, the better it will be for the buying public and the heating business.

The sales problems facing the manufacturer of automobiles and those manufacturing heating equipment differ in at least one respect.

The automobile manufacturer can, himself, build his machine complete, ready for use, by the ultimate purchaser. He can surround himself with his own engineers and craftsmen, keeping them under his own supervision and management. His own institution can assume the sole responsibility for seeing that the complete machine is designed and built in accordance with his specifications.

If the public were obliged to purchase the automobile in parts, the engine, chassis, body, carburetor, etc., from different manufacturers, have all these parts incorporated in a design, prepared by some independent automotive engineer, to be put together by another firm of assemblers or contractors, then the problem might somewhat resemble ours, with sales and growth no more rapid than our own.

A boiler, radiator or valve, alone, does not particularly interest the purchaser. What he chiefly desires is heating results from a complete heating plant. He wants heat when he wants it, where he wants it, in the quantities desired and under the same control he has over his automobile.

The manufacturer of heating equipment may and undoubtedly does build his products as well as the automobile manufacturer builds his, but before his products can properly serve the public, the architect, engineer, contractor and perhaps the manufacturer of other equipment have a certain part to play in the performance and none of them are in the control of the manufacturer, as they are in the present-day automobile business.

WHAT CAN THE HEATING FRATERNITY DO TO OBTAIN ITS SHARE OF THE BUSINESS?

Shall we improve our products, encourage better installations and deliver better and better service to the purchaser—or,

Shall we endeavor to meet competition with other so-called "out-of-date" or "inadequate" heating methods by encouraging, cheaper, and, therefore, "inadequate" radiator heating systems?

Shall we encourage heating contractors to lower their estimates on radiator heating by leaving off boiler and pipe covering, room thermostats, etc., where such are essential to the adequate and economical operation of the plant?

Shall we instruct them, in order to save labor and piping, to place radiators on the inside, instead of the outside walls, even though they should be placed in the latter position?

Shall we advise them to estimate on cheaper equipment, **so long as it is not of our own make**, so that they may come nearer the prices at which "out-of-date" or "inadequate" heating is sold in order to find a quick outlet for the sale of our particular product?

Undoubtedly, the heating fraternity's answer to these questions is —NO—unless we wish to wreck our industry.

Have automobiles sold so rapidly because they cost just a little more than horses and carriages? Has the public purchased house refrigeration plants because they cost just a little more than ice boxes? Does the lady of the house buy a washing machine because it costs only a little more than a tub and washboard? NO. These new devices cost more.

The consumer will buy anything on which he gets his money's worth. So let us make our radiator heating plants worth his money.

IS THE PUBLIC BEING MISINFORMED?

If the public seems to think that it can purchase a steam or hot water heating system for a six or eight-room residence at $1000.00 and more, I do not believe its estimate is so far off—provided the public wants good "adequate" radiator heating, which I think it does.

What the public knows as a six-room residence generally requires eight or ten radiators and an eight-room residence requires ten or twelve, if we are to properly warm the halls, baths, pantries, etc., and if I know anything of complete heating costs, such heating plants cannot possibly be installed complete and in a thorough manner for much less—if they are to adequately serve the owner and provided the contractor is to make a fair profit in his work, and, further, **considering prevailing costs of heating equipment.**

At any rate, even if the manufacturer or his jobber has any control of prices to be charged the consumer, by the contractor, it seems to me that **the contractor is worthy of his hire** and that we should encourage the installation of good, efficient radiator plants **at fair prices.**

HOW TO LOSE BUSINESS

In my judgment, the one procedure that could lose more sales for radiator heating than any other, would be the sale and installation of cheap, competitive and consequently "inadequate" plants that even then would cost the public more money than other so-called "inadequate" methods and perhaps serve less efficiently. As every salesman and heating contractor has said, at one time or other, one bad installation will do more harm to his business than ten good ones will do good.

POSSIBILITIES FOR GREAT GROWTH

I agree that this industry has possibilities for great growth and expansion, but not, necessarily, through the same procedures that may be employed in other business.

I am also a thorough believer in advertising and selling, but let us not make the error of offering something for sale that we can not deliver. Let us not attempt the impossible, of furnishing good "adequate" heating plants at the prices at which "inadequate" plants can be bought.

SPEAKING FOR OURSELVES

It seems to me that if we are to support intensive advertising campaigns and "door-bell ringers", that we must first be certain that "our own house is in order". Advertising can not eventually support any but an unquestionably meritorious project.

I am only speaking for myself, my company and its policies when I suggest that we, the manufacturers of heating equipment, give careful consideration to the following factors involving our problem.

OUR RESPONSIBILITY TO THE ARCHITECT

Building and chimney design and construction play as important a part in heating adequacy and fuel economy as heating equipment itself.

It has been said, many times, by men who have had experience, that if they were to build again, they would erect the heating plant first and construct the building around it.

This has been only one way of stating that their previous building had been so designed and erected that it was difficult to apply a heating plant that would adequately and economically warm it and that responsibility for heating results rested as much with the architect as with the heating engineer.

In fact, when this country entered the European War, an architect was heard to suggest that the heating engineer could do a great service for his Country by considerably improving his heating systems so as to conserve the nation's fuel supply. The engineer's retort was that the architects in one state could do more, in this respect, than all of the engineers in the country could do by constructing their buildings to retain the heat instead of losing it as fast as the best heating plants could deliver it.

The architect is a big factor in seeing that the manufactured heating plant is properly designed and that the equipment can and will be properly installed. No matter how well it is built, if improperly applied or if installed under improper building conditions, it can not adequately serve the public.

Therefore, let us co-operate with the architect in every possible way. Let us not encourage improper installations simply to force sales.

THE CONTRACTOR AND HIS PRICES

My experience has shown that good contractors, like good manufacturers, recognize their responsibilities. However, destructive price cutting generally injures the cause. When contractors are obliged to accept work, at prices that are too low, they are forced, in order to prevent loss, to "dicker" with manufacturers, **resulting in the selection of cheaper and inferior products to the ultimate grief of the buyer of radiator heating and the industry as a whole.**

THERE IS NO MYSTERY AS TO THE MERITS OF RADIATOR HEATING

Certainly, steam and hot water heating systems have a great many fundamental advantages over other methods—better and more even heat distribution—much longer life and consequent lower final cost—economy of operation—superior life and health protection and saving of building space. On these and other points the public should be informed and if it is convinced, our industry need not fear inferior or inadequate competitive methods even though they may be purchased by the public at a much lower cost.

Failure to appreciate the importance of good engineering in the design of complete heating plants; or—

Failure to discourage, at all times, the improper installation of heating equipment; or—

Any disposition to encourage destructively low prices which can not carry good workmanship and service, in order to find a quick outlet for the sale of our products, will not foster the growth of our industry.

A MAN IS WORTHY OF HIS HIRE

A man is worthy of his hire, be he manufacturer, architect, engineer or contractor and so long as our sales problems incorporate **us all**, let **us all** co-operate, with equal consideration **for all.**

Yours for building the radiator heating industry on a solid, substantial foundation for a future growth consistent with its merits.

HERMAN W. NELSON
President

OUR POLICY—

We cannot, nor do we hope to always meet our competitors' prices, because we expect to indefinitely, continue our policies, maintained for the past twenty years; that—

Of building the best equipment we know how to build—

Of sincerely co-operating with the architect, engineer and contractor, to prevent improper designs or the installation of our equipment under improper conditions, even though we lose sales—

Of encouraging adequate compensation for all members of the fraternity, including those architects, engineers and heating contractors who perform good work and deliver good service to the public—and we respectfully solicit their patronage.

THE HERMAN NELSON CORPORATION, *Moline, Ill.*

Builders of Successful Heating and Ventilating Equipment for over 20 Years

Sales and Service

BELFAST, ME.	BUFFALO	CHARLOTTE, N.C.	CLEVELAND	INDIANAPOLIS	GREEN BAY	ATLANTA	KANSAS CITY	SPOKANE	VANCOUVER
BOSTON	PHILADELPHIA	GRAND RAPIDS	COLUMBUS	CHICAGO	MINNEAPOLIS	MEMPHIS	OMAHA	PORTLAND	TORONTO
NEW YORK CITY	SCRANTON	SAGINAW	CINCINNATI	DES MOINES	ST. LOUIS	DALLAS	DENVER	SEATTLE	WINNIPEG, MAN.
UTICA	PITTSBURGH	DETROIT	TOLEDO	MILWAUKEE	BIRMINGHAM	EMPORIA	SALT LAKE CITY	SAN FRANCISCO	CALGARY, ALTA.

Our Contribution
to the art of Heating & Ventilation

FIVE YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable.

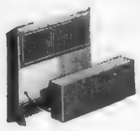
The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequaled performance.

HEATING · VENTILATING · COOLING · DRYING · CONDENSING

UNIVENT

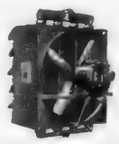
for the ventilation of schools, hospitals, offices and other buildings presenting an acute ventilating problem.

HERMAN NELSON
Invisible
RADIATOR



... supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

THE HERMAN NELSON
hiJet
UNIT HEATER



It operates at steam pressures from 1 to 150 lbs., and offers the better and more economical way of diffusing heat in Factories, Railroad Shops, Roundhouses, Mills, Warehouses, Garages, Gymnasiums and Industrial Buildings.

Herman Nelson
Radiator Sections
for Blast Heating and Cooling

Indestructible, operating at any steam pressure from 1 to 150 lbs., non-corrosive and leak-proof.

May be arranged in banks to solve any special problem of heating or cooling.

THE HERMAN NELSON CORPORATION · *Moline, Illinois*

Builders of Successful Heating and Ventilating Equipment for over 20 Years

Sales and Service

BELFAST, ME.	BUFFALO	CHARLOTTE, N. C.	CLEVELAND	INDIANAPOLIS	GREEN BAY	ATLANTA	KANSAS CITY	SPOKANE	VANCOUVER
BOSTON	PHILADELPHIA	GRAND RAPIDS	COLUMBUS	CHICAGO	MINNEAPOLIS	MEMPHIS	OMAHA	PORTLAND	TORONTO
NEW YORK CITY	SCRANTON	SAGINAW	CINCINNATI	DES MOINES	ST. LOUIS	DALLAS	DENVER	SEATTLE	WINNIPEG, MAN.
UTICA	PITTSBURGH	DETROIT	TOLEDO	MILWAUKEE	BIRMINGHAM	EMPORIA	SALT LAKE CITY	SAN FRANCISCO	CALGARY, ALTA.

Sectional View
No. 6 Multiflex Trap
Exterior View
No. 6 Multiflex Trap
Sectional View
Modulation Valve
The regulation is self indicated on the dial; less than one full turn of the handle opens full from shut to full opening
ON
Top View
Modulation Valve

An Ideal Combination

The Bishop & Babcock bellows type radiator trap and bellows inlet valve are made with all interchangeable parts and are insured an indefinite life by the use of seamless Multiflex bellows, manufactured in our own plant. Both are tried and proven articles, and behind them is the experience of many years of one of the largest companies engaged in this line of business.

These valves are typical of the thoroughness with which we have engineered our line for many years in the direction of both simplicity and efficiency.

The Bishop & Babcock Line comprises Vacuum and Vapor low pressure Heating Specialties; a complete system of Automatic Temperature and Humidity Control; Massachusetts Squirrel Cage Fans, Air Washers and Unit Heaters.

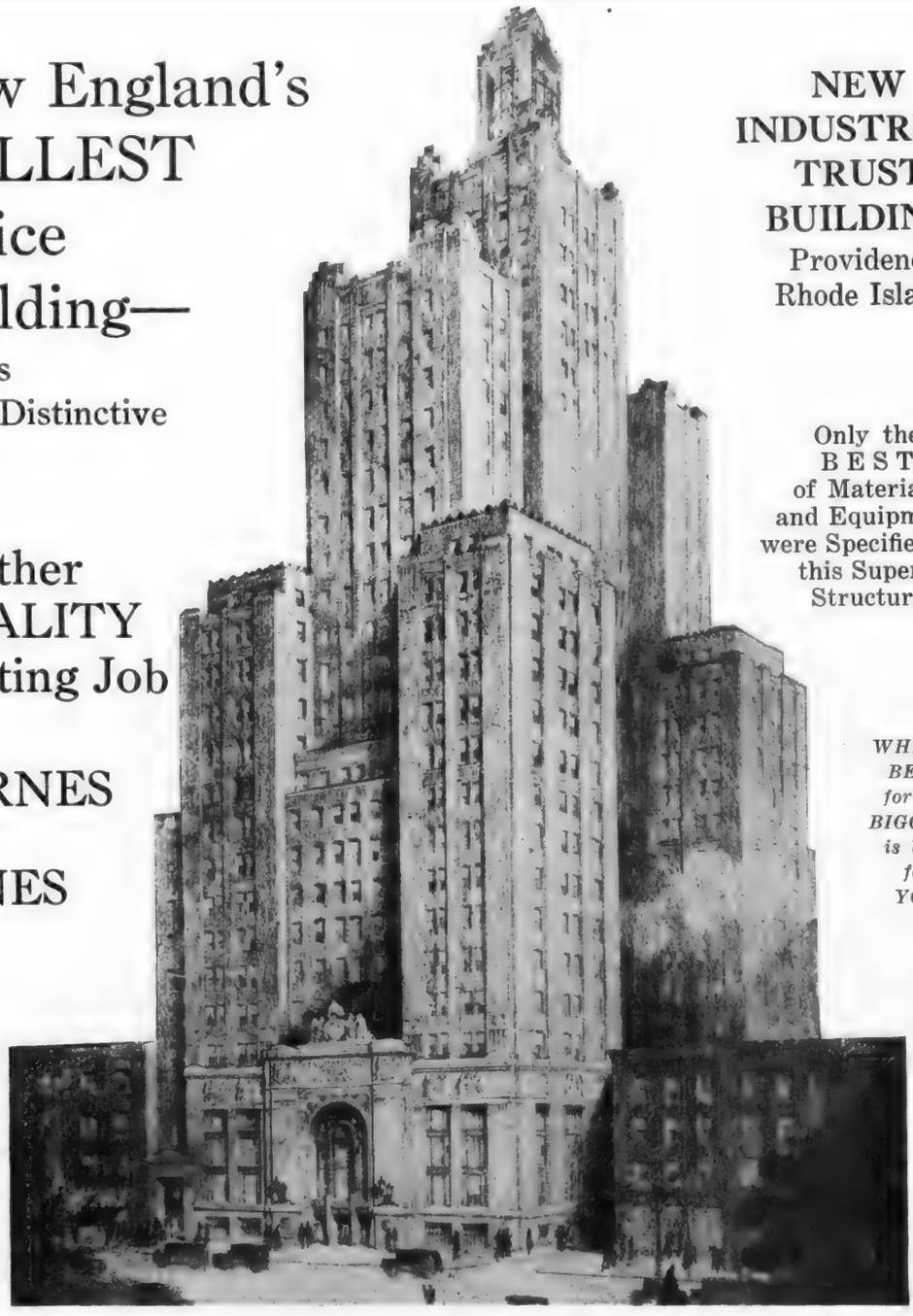
Architects and Engineers who standardize on Bishop & Babcock Apparatus insure uniformity in design and operation not to be found in equipment of varied manufacture.

THE BISHOP & BABCOCK SALES CO.
General Offices 4901-4915 Hamilton Ave., N.E.
CLEVELAND, OHIO
Branches and Representatives in Principal Cities

BISHOP & BABCOCK
TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

New England's TALLEST Office Building—
and its Most Distinctive

Another QUALITY Heating Job
by
BARNES and JONES



NEW INDUSTRIAL TRUST BUILDING
Providence
Rhode Island

Only the BEST of Materials and Equipment were Specified for this Superb Structure

WHAT'S BEST for the BIGGEST is best for YOU

Architects, Walker & Gillette
Associate Architect, Geo. Frederick Hall

Heating Contractors
General Fire Extinguisher Co.

General Contractors, Starrett Bros.
Heating Engineers, Baker, Smith & Co.

Barnes & Jones

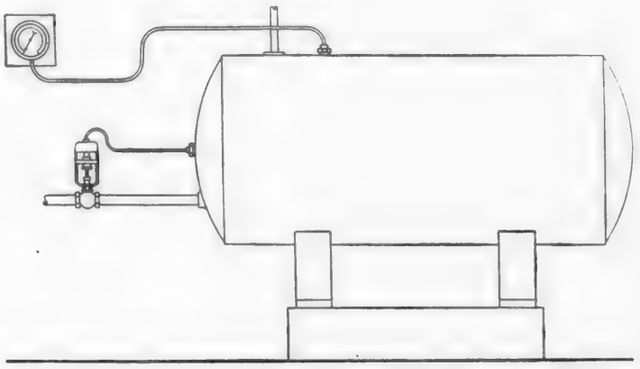
Modulation Vapor and Vacuum Heating Systems of Proven Quality

128 Brookside Ave.
Jamaica Plain, Boston

101 Park Avenue
New York City

MORE PROFIT FOR YOU— and All Your Customers Happy

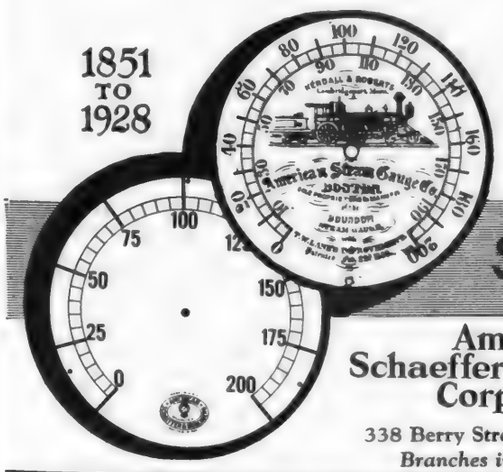
When you install the American Precision Temperature Controller you can be sure of another happy customer. With favorable conditions, regulation within 1° F. will be maintained constantly. This means a saving in steam and labor and time and money.



An American Precision Temperature Controller and Dial Thermometer applied to a hot water service tank. The Controller constantly maintains the water at the proper temperature and the Dial Thermometer shows the exact temperature at a glance. This thermometer may be located any distance up to 200 ft. away from the tank.

The New American Precision Controller is low in cost. It's a good investment. If you doubt it, try one. You will not be expected to keep it unless you are completely satisfied.

Mail the coupon today for description and prices.



AMERICAN INSTRUMENTS

SINCE 1851

American Schaeffer & Budenberg Corporation

338 Berry Street, Brooklyn, N. Y.

Branches in principal cities

American Schaeffer & Budenberg Corp.,
338 Berry St.,
Brooklyn, N. Y.

Please send me your folder R-14 on the New American Precision Controller

For .....

Name .....

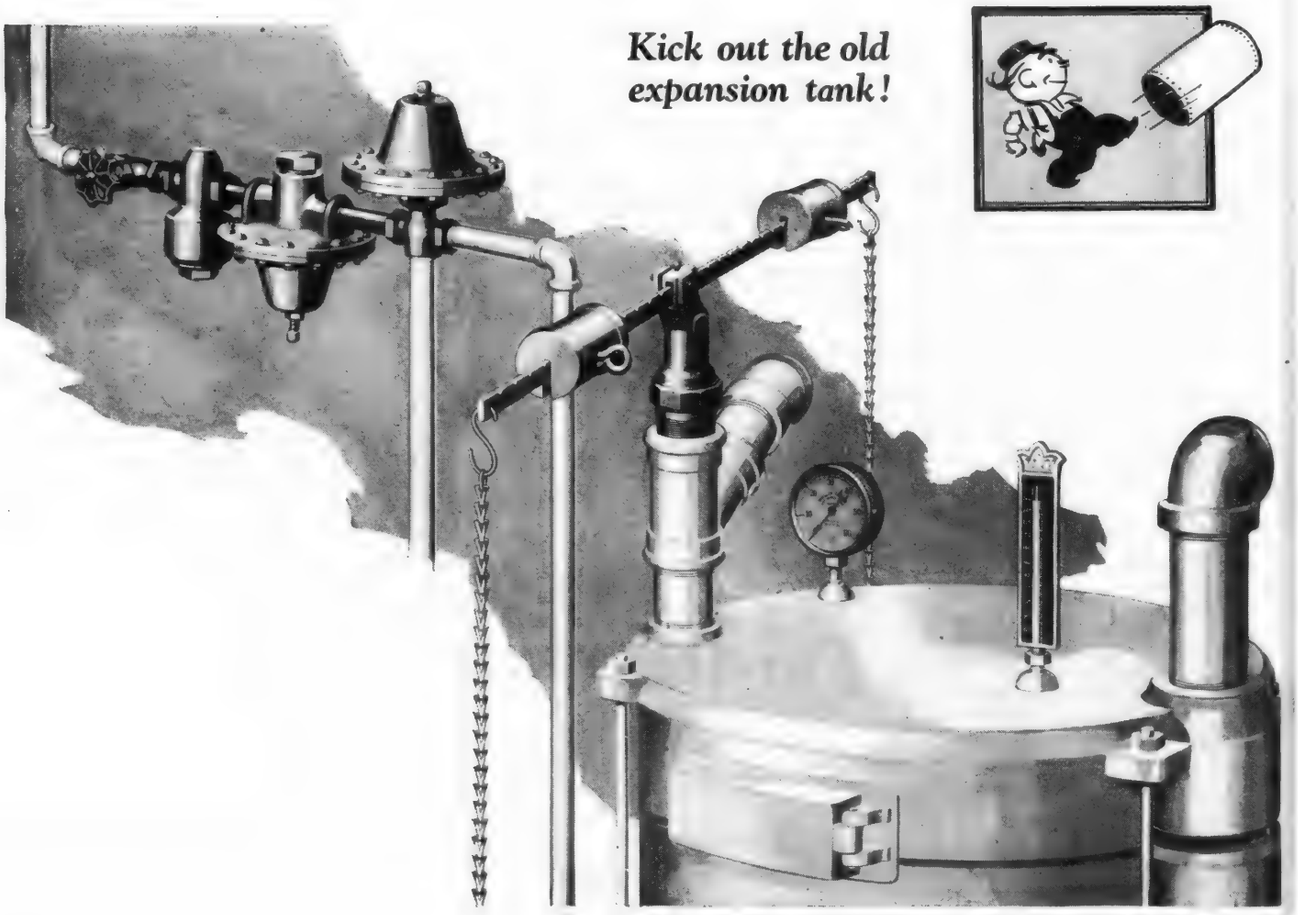
Company .....

Street .....

City ..... State .....

It pays to recommend

and owners are *demanding* Mueller Automatic Heat Control for thousands of hot water heating plants. Contractors are recommending the Mueller System because it eliminates the unsatisfactory expansion tank, both overhead and in the basement. In addition it furnishes automatic supply, automatic relief and automatic damper control. It regulates temperature and saves fuel.



what the market demands—

Why install anything less satisfactory? The Mueller System can be used on new or old hot water heating plants.

Mueller Automatic Heat Control is quickly installed on either new or old jobs. It carries a good margin and reduces your labor costs of installation. It costs your customers no more than the old-fashioned expansion tank system—yet gives them a better job.

These 9 advantages explain why owners prefer the Mueller System

1 No expansion tank, either open or closed.

2 No more expensive than expansion tank system and installed much more quickly.

3 Water in system is always fresh.

4 Rate of circulation is increased, due to pressure and fresh water.

5 Entirely automatic as to supply, relief and damper regulation. Requires only minimum attention.

6 A very considerable saving in fuel through automatic damper control and more rapid circulation.

7 Perfectly safe. Reducing valve and relief valve are operated by pressure of water in the system.

8 Reducing and relief valve are positive in action and are the safest type known.

9 Boiling point of water is raised, allowing more efficient heating throughout system.

The astonishing increase in sales of Mueller Systems shows beyond question that hot water system owners want this better control. Filling this popular demand means desirable, profitable business for you. Why not get your share? Write today.

MUELLER CO.

Established 1857 Decatur, Illinois

Branches: New York, Dallas, San Francisco, Los Angeles.
Canadian Factory: MUELLER, Limited, Sarnia.

MUELLER

Automatic Heat Control System

Of Vital Interest and a Source of Valuable Information!

The many advantages of heating with vapor [sub-atmospheric steam] are fully explained in Bulletin 22 [AIA30c2]. Everyone who has to do with the heating of buildings should have this book.

A cross-section of the contents:

How to avoid overheating—giving greater comfort and a 30 per cent fuel saving.

Radiators can be kept hot for hours with fires banked, and system under vacuum vapor.

Radiation of buildings 50 per cent excessive for average outside temperatures.

Steam tables giving temperature, latent heat and boiling point at all pressures possible in a heating system. The latent heat of steam *increases* with reduced pressures below atmosphere.

Standards for computing radiation and boiler sizes.

ILLINOIS Thermo Modulating Systems of Vapor Heating are the *Pioneer* successful systems operating at LESS than atmospheric pressure. It will pay you to investigate the wonderful record of these systems as demonstrated by 15 years of successful operation.

Write TODAY *for Bulletin 22*

General Offices and Factory: 21st Street and Racine Ave.

REPRESENTATIVES IN 40 CITIES OF U.S.A.

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD President INCORPORATED 1900

CHICAGO

No. 999

The new ARCO PACKLESS VALVE

NEW PRICES

NEW BEAUTY · MECHANICALLY IMPROVED

MEMBERS of the heating profession know that Packless Radiator Valves should be used on every job—large or small; steam, water, vapor or vacuum.

Every heating merchant will wish to give his customers the advantages of Packless Valves—Packless protection against expensive leaks; Packless relief from the annual cost of repacking; Packless assurance against the leakage of air into "below atmosphere"—vacuum-installations.

You know that ARCO Packless Valves will save owners their cost over and over again—that in the long run they are actually less expensive than packed valves.

Because this is so, the American Radiator Company has been striving to build an ARCO Packless Valve so priced that you can sell it on *every* job—an ARCO Packless Valve that will give the same protection to the owner of a cottage, a palatial residence or a towering skyscraper.

The American Radiator Company has produced this valve and now presents the new ARCO Packless No. 999. Handsome in appearance—Sturdy—Opens with one smooth turn—And at a price that represents the greatest value ever offered in the field of radiator valves.

Write today for prices. The sale of this valve will mean more business for you. Three minutes of your time or your journeyman's will make extra dollars for you and save dollars for your customer. Every prospect will quickly and gladly pay the trifling difference in cost per job between the New ARCO Packless 999 and the cheapest packed valve made. All you need do is explain the benefits and saving of ARCO Packless Valves No. 999.

The New ARCO Packless Valve No. 999

THESE valves are made in sizes from ½" to 1½" inclusive and in Angle, Corner, and Globe patterns with round and lever handles, also in graduated types. In addition, they are available in the "True Corner" type especially suited to Phantom radiation.

They are of sturdy design throughout, amply heavy for any possible kind of heating service. They have liberal hexes, nuts and tail pieces and are easy to install. They will last throughout the life of the building.

They are handsome in appearance and are well finished.

A feature of prime importance is that when used on one-pipe steam systems, the return flow friction is reduced to a minimum and the water of condensation has free egress. They are thus well adapted to one-pipe steam and all other types of heating systems.

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION, Dept. "H"
40 West 40th Street New York, N. Y.

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.

Mack Truck Corporation Service Station, Albany, N. Y., heated by Ilg-Aerofin Units swung overhead out-of-the-way. This Corporation is using more than 200 such Units in 12 different Service Stations.

AEROFIN

Banishes the Bugbear of the Heating Contractor

by making the Installation of Fan System Heating Surface Easy, Speedy, Inexpensive and subject to accurate Cost Estimate

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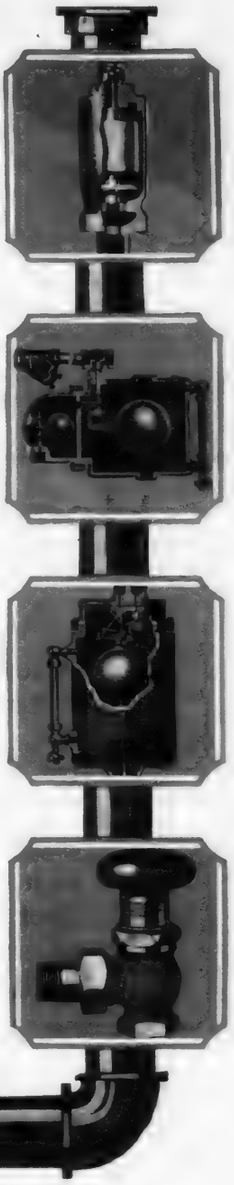

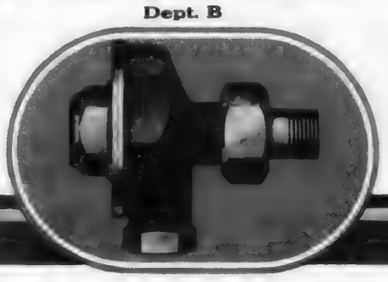

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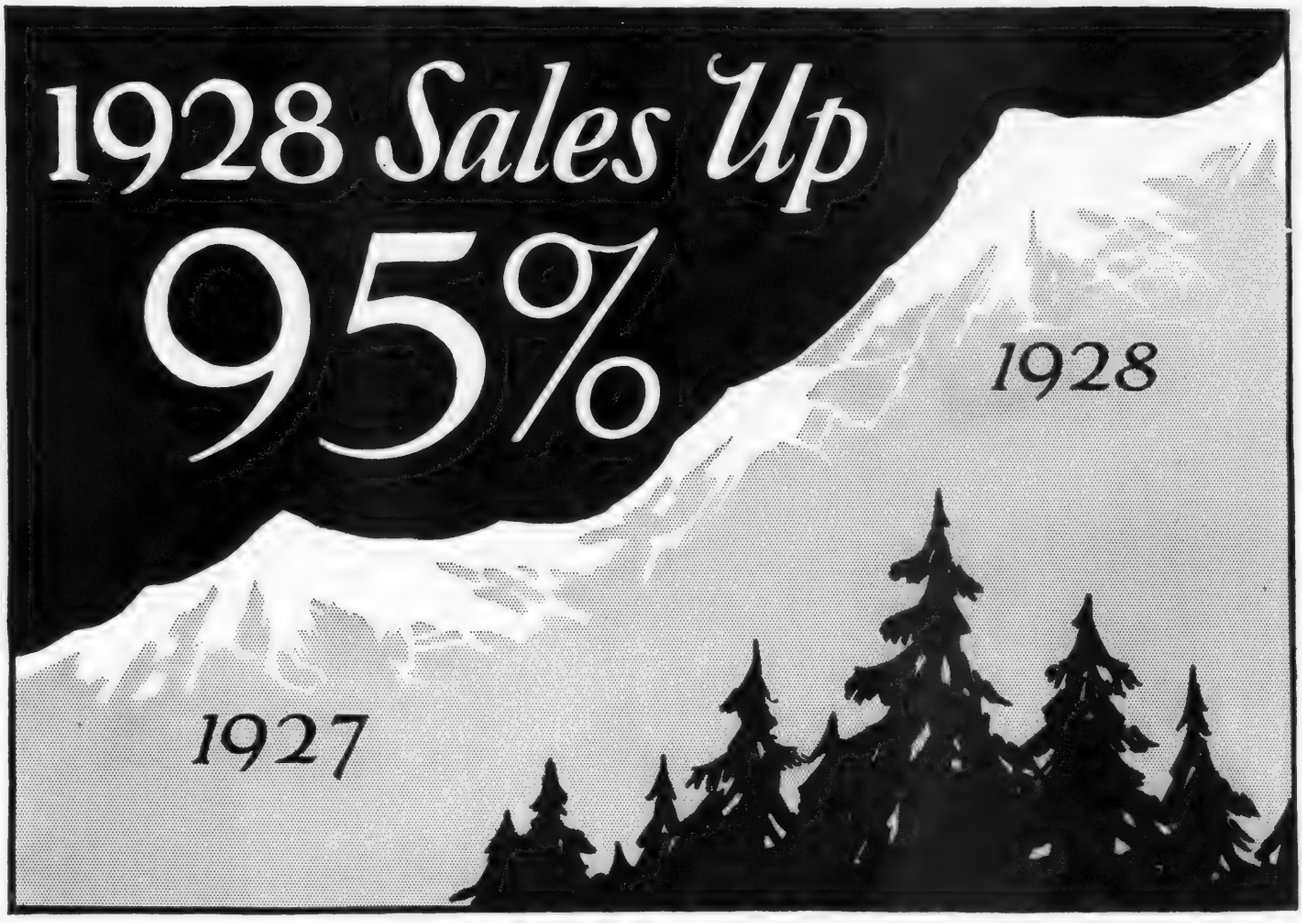

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The Heating & Ventilating Magazine

Volume XXV

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Number 7

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YEARLY SUBSCRIPTION $2.00 **SINGLE COPIES, 30 CENTS**

Published monthly at 386 Fourth Avenue, New York, by The Heating and Ventilating Magazine Company.

Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

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Turning Points

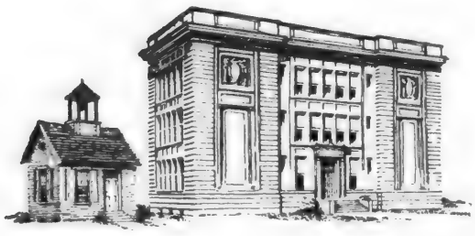
EVERY little while we come to a turning point in the industry. It was so when air washers were introduced, when CO_2 lost its significance as a criterion of air purity, when unit heaters and unit ventilators became acceptable to heating men, when dry air-filters made their appearance, when light-weight heating surface was perfected and, lastly, when concealed heaters in their present form took the industry by storm.

To many thoughtful people it looks as if we are on the threshold of another turning point—this time of a major character, for it involves the status of the heating contractor himself.

In the new dispensation, if we read the signs of the times aright, the heating contracting industry is to take its place alongside of those industries which cater to the comfort, rather than to the utilitarian, side of life.

The manufacturers have shown the contractors a great light and the effect must be nation-wide. To say that the contractor will become a merchant hardly expresses it. To be sure, he will be located on Main Street, but when you visit his place of business, you will know you are dealing with one of the principal commercial enterprises in town. The heating contractor of the future will aggressively meet the needs of the community in every item that pertains to heating, be it in the form of boilers, radiators, oil burners or gas heaters.

A. V. Armagnac



. . . and we're heating the new school house with the heat that's left over from the old school house

—*with apologies to Josh Billings*

It took two hundred tons of coal per year to heat the Elementary School Building at Ludlow, Kentucky. And then, in 1920, Ludlow built a new high school adjacent to the elementary school—and, while they were planning a Webster System for the new building, it was decided to modernize the heating system in the old building and heat both buildings from one boiler plant. Now—to heat the two school buildings requires only one hundred and sixty tons of coal per year.

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Chisholm Junior High School, Chisholm, Minn.
William Penn High School, Harrisburg, Pa.
Plant Senior High School, Tampa, Fla.
Hyde Park School, Cincinnati, Ohio
Intermediate Colored School, St. Louis, Mo.
Appalachia High School, Appalachia, Va.

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

The Heating & Ventilating Magazine

Volume XXV JULY—1928 Number 7

How One Heating Contractor, Combining Old-World Craftsmanship with Modern Sales Methods, Developed a Non-competitive Business

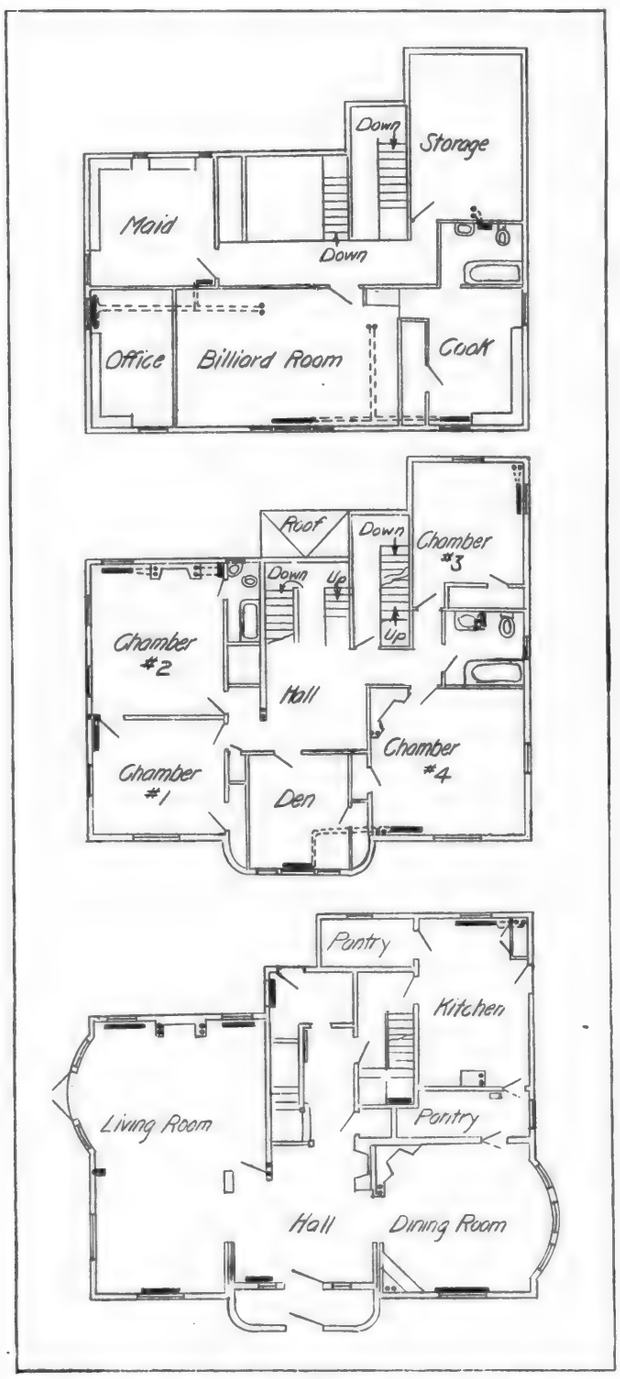
By David B. Hayes

CONFINING activities almost entirely to the replacement of obsolete heating plants might seem, at first glance, to so limit a heating contractor that no man would go into this kind of work with his eyes open.

Based on an experience of several years, I am convinced that an almost limitless field is opened to the type of man to whom such a specialized and, at present, unusual class of business appeals. Perhaps I am a little eccentric and like to do things not precisely in line with the hard and fast customs of the trade. I think a great deal of life and I believe that I must keep my work interesting if I am to be stimulated each day by what I have done the day before. My work appeals to me, not only for the livelihood obtained from it, but from the very human feeling that I have contributed to the comfort of those whom I number as my clients and friends. Perhaps it is this very fact—that I aim to create a friend whenever I secure a client—that

makes my activities of increasing interest and income.

Essentially this kind of work is non-competitive. Much of the drudgery and heartbreak in a business is removed when one never thinks of substituting inferior or skimped material; when one computes an honest and reasonable price for a given installation and submits it to a prospect with the knowledge that it will not have to be "shaded" to beat the price submitted by a rival; when the resulting installation, in almost every case, so delights the customer that a check "in full" cheerfully is handed over on completion of the work. I would rather have my present business with its volume and net profit than that of many contractors who do an aggregate five times as great as mine and whose "paper" profits probably are honeycombed with slow and uncollectable accounts.



First, Second and Third Floor Plans of Home in Which a Steam Heating Plant Was Installed to Replace a Warm-Air Furnace

CONTRACTOR AND WORKMEN MUST HAVE HIGH IDEALS

Not only have I found it possible to maintain the ideals indicated, but I have been fortunate enough to inoculate my men with the same ideas. Every man in my employ feels, when he leaves each job on which he works, that he honestly has done his best as a craftsman and that the home-owner has the same kindly and appreciative feeling for him that he has for "the boss." The public generally classes a heating contractor with the much maligned plumber, who, it feels, forgets most of his tools when he comes to a job; does everything in the most unworkmanlike manner; makes as many mistakes as possible; uses three or four fittings when one would answer, and, in general, is tolerated only because he is an absolute necessity.

The neighbor of one of my customers had a hot-water heating plant put in her home to replace a warm-air furnace. One of the workmen put his foot through the ceiling; holes were cut for pipes that were not installed; at night, openings in floors were not made secure and tools were left where they were dropped. Occupants of that home were in a state of turmoil for days. The owner told my customer, who had decided to change from warm-air to a vapor system, what to expect "when those careless, horrid plumbers commence to rip your house all to pieces." The appreciation of my customer, of the entirely different manner in which her job was handled, alone would have compensated me for the pains I took with this installation, but even more tangible returns came as the result of her boosting. I have received a number of unsolicited contracts as the result of such situations and, speaking selfishly, the financial return on conscientious work is not insignificant.

ESSENTIALS FOR SUCCESS IN HEATING PLANT REPLACEMENT

Work of this kind is out of the ordinary and has definite requirements and limitations. A man must be enthusiastic and give it his undivided attention. He must be content with a comparatively small volume of business and be prepared to cover a large area. Probably, he will have to stand the gaff of disappointment in early stages of developing such a business. He must train men to do this class of work and not attempt to use them on cheap work as a filler; they soon will become careless on the good work, or eat up the profit on the cheap work. Only a specialist in this activity can make a profit. The season, particularly in the northern part of the country, is short because most of the work must be done outside of the heating season. The greater part of the winter is devoted to developing pros-

pects for spring contact, to checking over and making reports on antiquated plants, and to rendering first aid to "sick" heating plants, installed by others. Naturally, this sort of thing tends to make one unpopular with those heating contractors whose ideals are on a much lower plane.

Such a business brings the heating contractor into a much more intimate relationship with the home-owner than does conventional contracting, where the contractor merely submits a bid for an installation, based on drawings submitted to him. His first task is to create a feeling of confidence that his interests and those of the home owner are almost identical, that he knows what he is going to do before he starts his work and that he is a specialist in his line. Many replacement jobs come to grief because they were started with little or no planning and the workmen have run into unseen obstructions and have had to pull out part of the work and start all over again, leaving ugly holes that could not be properly covered up.

Much of my work has been in homes of the better class and it was only logical that I should play on the pride of the owner in getting a modern heating plant without having his house torn to pieces and his walls and floors badly scarred.

THE APPROACH TO THE PROSPECTIVE CLIENT

No definite rules can be laid down for securing and carrying out a contract of this kind and no two problems are identical. My general method is first to see the owner and have a talk with him as to the type of heating plant best adapted to his requirements. I explain the different systems, their characteristics and what to expect from them in certain kinds of weather. In this first visit I definitely lay a foundation for a non-competitive job. I am careful not to stay so long as to become tiresome, but when I leave I make a definite appointment to come back and measure the house for a heating plant.

As a usual thing no plans are available for these older homes, and the next call, when I secure measurements from which to make a set of plans is the most important of all. I go over the house carefully, taking accurate dimensions of the rooms, determine the thickness of the partitions, note where the old warm-air ducts are located, the direction or "lay" of the floor timbers, size of the chimneys, the length and width of the chimney breasts, the sliding-door partitions, closets on all floors and the general arrangement of the furniture and the height of windows from the floors. If any suggestions are made by the owner as to the desired location of the radiators in any particular rooms, notations are made. With this information, I return to my office and draft, with pencil and ruler, a plan of the house to scale, using a transparent paper. By transposing these plans, it is evident just where partitions are over each other and where they are not. Experience in this kind of work tells me where to plan for all piping. Not much work or time is required to complete these plans and lay out the piping, and the owner and the members of his family always show a keen interest in the "plans for their own house" as they feel that something special is being done to provide for them greater comfort.

Not Even a Flooring Expert Could Tell that a Register Once Occupied this Floor Space—the Single Dark Piece of Flooring is a Border Strip

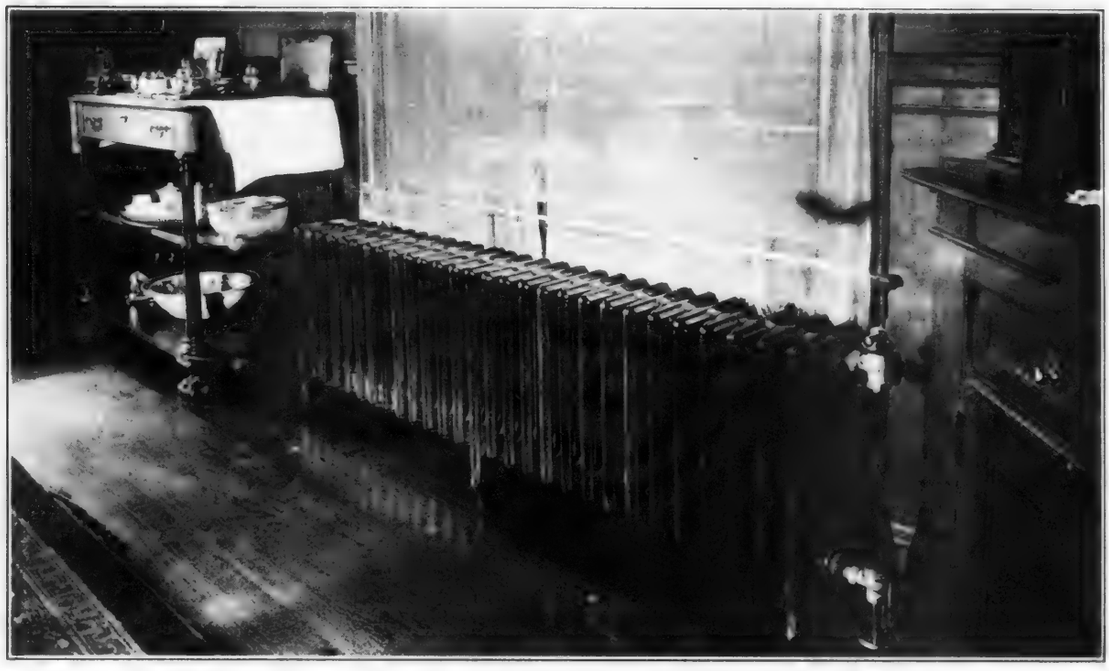
I then determine all pipe and radiator sizes and locations and, either by phone or letter, I arrange for the next visit and this appointment is kept to the minute.

We go over the plans and I explain the locations of radiators and pipes and make any changes that the owner wants. I then figure the cost of the job. By this time, I practically have sold the customer not only the heating system and myself but I have prepared him to anticipate about what the price will be without even mentioning the amount.

I now am getting to be a friend of the family. I arrange, before I leave, to return with a contract and I am not exaggerating when I say that many times I have had a contract signed before the owner knew exactly what the cost would be. I have my customer in a condition in which, when we commence to do our work, we are not hampered in any way. We may remove floors, move furniture, or do anything else that is necessary for the proper installation of the plant with the heartiest cooperation from members of the family.

WHY THE OWNER IS PROUD OF HIS NEW HEATING PLANT

When the job is finished, I go over it carefully with the owner. The boiler and pipes are covered, not in the ordinary way, but with care for every detail. All covering has been painted white and the pipe covering banded. Exposed uncovered pipe in the basement has been painted black or with aluminum bronze. The boiler trimming has been coated with heat-resisting black enamel; even the cellar floor has been cleaned and mopped. A plate with my name and address occupies a conspicuous place on the front of the boiler. I am proud of it



This Radiator and Its Piping Have Been Made as Inconspicuous as Possible by Paint Matching the Oak-Paneled Wall

and so is my client. It is worth more to me than a front-page advertisement in the local paper.

We go upstairs. All of the floors have been relaid and finished in such a way that even a trained man would have difficulty in telling where registers have been. Each radiator is carefully decorated to harmonize with the color scheme of the room in which it stands. Not a single pipe is visible, except in a few cases in closets and passage-ways.

I turn the system over to its thoroughly satisfied owner and, in almost every case, a check is in my pocket before I leave the house, while not infrequently I am directed to call on a friend of the family as a new prospect. I am frank to say that I owe a large measure of my success to the equipment used. In many cases, especially under the floors for second and third-floor radiators, it is necessary to use very long laterals and while pipe sizes are increased to offset the long runouts, I feel certain that I could not properly regulate the flow of vapor to the radiators without using a special type of valve, which has become, with me, a standard.

In order definitely to indicate some of the problems that arise in carrying on a business of this kind, I will outline the outstanding features of two contracts.

SOLVING A SPECIFIC REPLACEMENT PROBLEM

The plans shown on Page 64 were made for a home built when the warm-air furnace was popular. Some alterations had been made, the chief of which was the conversion of two rooms to the present living room. Also, one of the chambers appeared to have had the duct in the outside wall; this was part of the original partition in which the duct was, or had been, put when the remodeling was done. On the third floor, the child's playroom was converted into a billiard room, so that the partitions on the third floor do not follow the partitions on the second floor.

This home had, on the entire first floor and in the second floor halls, quarter-sawed white-oak flooring, 3⅛-in. wide, and quartered white-oak panelling in the halls and dining room. The warm-air furnace had been leaking gas badly, making conditions almost intolerable in the winter season. The owner was extremely anxious to get away from the dirt and odors of the furnace, but would not consider pipes in the rooms. He was convinced that the removal of the registers from the floors could only result in a badly patched-up floor job.

All the warm-air ducts were on the inside of the house, except the one pipe going up to the living room. There was no heat in the kitchen, or in the room over it, except what came in from the halls. With the heating plant now installed, not a pipe is visible in any room. The pipes to chamber No. 3 pass through a kitchen closet and the pipes to chamber No. 4 and the den are in a space back of the china closet in the dining room. Those to the bathroom are in a space used by the soil pipes and those for the second-floor hall are in the coat closet. (The owner claims that this pair of pipes keeps his ulster and cap always warm.) The pipes to chamber No. 2, and to the bathroom that adjoins it, are run up each side of the chimney breast.

Serving the radiators on the third floor are very long runouts under the floor. This is where the modulating valves become a big factor in controlling the heat. Pipes to the office and maid's room were brought up through the warm-air duct and carried under the floors, but there was practically no cutting of timbers here as the bays through the middle of the house were from front to rear, while those over the chambers below were from the center

to outside and it was at this point that I brought the pipes from the cellar. For the billiard room and cook's room, I followed the three-cornered space by the side of the fireplace which was large enough for a small man to drop into and cut holes through the second floor so that we could drop to the basement. In this wise we met the objection to unsightly pipes in the rooms.

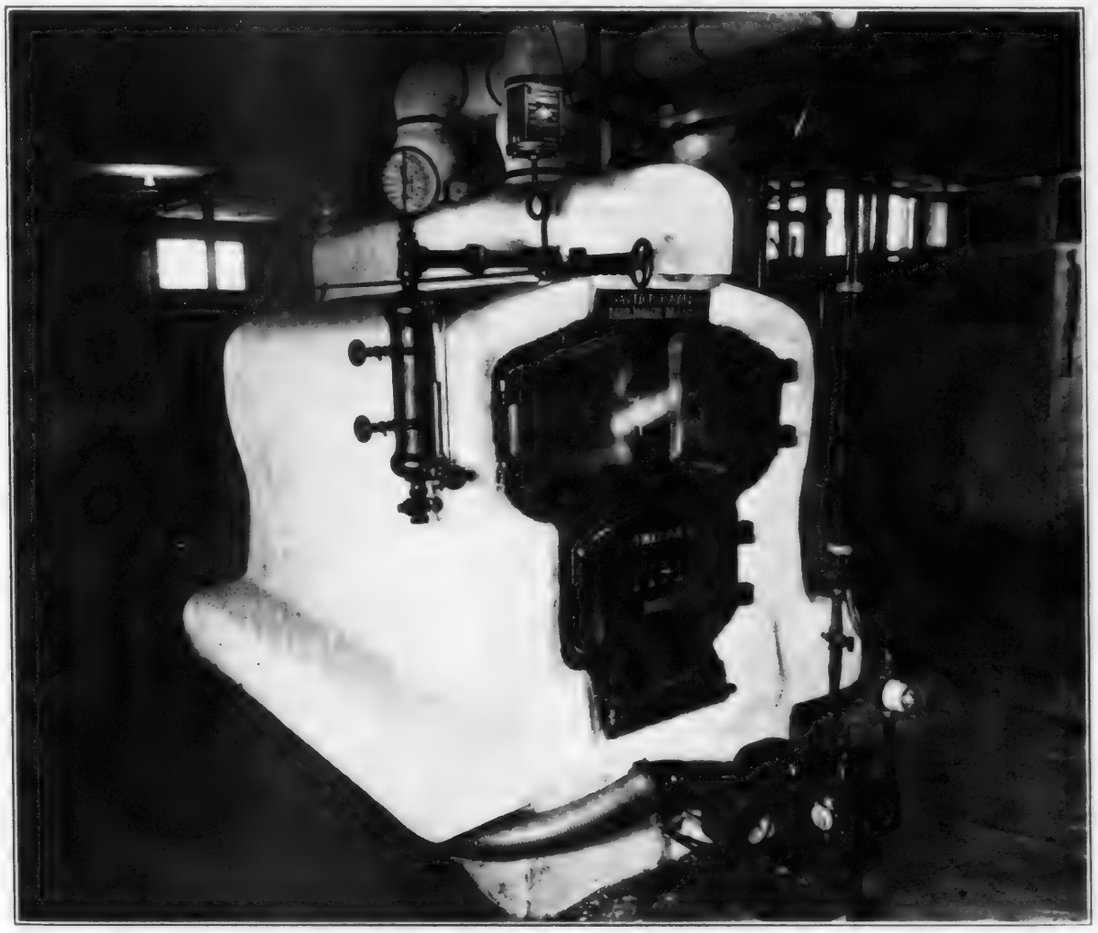
REPAIRS TO FLOORING REQUIRE SPECIAL CARE

All hardwood floors were repaired with the same grades of oak that originally were used and this flooring had to be made to order. When the work was completed, the owner could not pick out the places where the old registers had been. Radiators in the front hall were of the legless type so that the rugs would fit as they did before the radiators were installed. They were decorated to harmonize with the light quartered-oak panelling and flooring, as was the one in the dining room. The living room was finished in white enamel and the radiators, covered with a special enamel, are just as white today as they were a year ago when the plant was installed. It was a matter of no small interest to me that, after I had completed the contract and turned it over to its owner, he employed a painter to come into the cellar and paint the walls and ceiling so that they would match the work I had left.

(*To be concluded*)

How the English Regard Electric Heating

WITH electricity at 2c per K.W.H., an electric fire can often compete in cost with the open coal fire, especially when the period for which the heat is required does not exceed three to four hours. But the advantages of cleanliness, labor saving and convenience of electric heating should not be overlooked. Heat requirements of different rooms vary much, but as a rough rule 1½ to 2 watts per cu. ft. of space should be allowed for sitting rooms, and half this amount for bedrooms. Panel heaters, either of the flush or surface type, also are in demand. For general purposes 12 sq. ft. of panel should be allowed for every thousand cubic feet of space, or 0.5 watt per cubic foot. Such panels cost about $3 per sq. ft. for reasonable length. Owing to the time lag the panel heating system cannot compete with the electric radiator for short-period warming. It is essentially a long hour system, and may be switched off for a couple of hours over the peak load without noticeable effect on the rooms. In general, heaters will not be on for more than five hours per day during the winter months.—*A. J. Milne and R. H. Rawll, in the Electrician* (*London*), *April* 6, 1928.



Finished in a Workmanlike Manner, this Oil-Fired Boiler Has Replaced a Furnace in a New England Home

Gas Heating *for the* Heating Contractor

Part II—Climatic Conditions on the Pacific Coast Favor Gas Heating and Southwestern States Enjoy Advantages of Natural Gas

By G. C. Carnahan

THE Pacific Coast region is, without doubt, the greatest user of gas for heating, per capita, of any part of the United States. Extending as it does from Canada to Mexico, and having a large variation of climate and gas conditions it presents a concrete example of where gas heating can and cannot thrive. In the State of Washington manufactured gas only is available and gas heating has met with only fair success. Low-priced electric current from hydro-electric developments and free sawmill waste are effective competitors. Warm-air furnaces predominate for both gas and solid fuels.

Portland, Ore., is thoroughly sold on gas heating. It is the most successful city of its size in the sale of manufactured gas for this purpose. Temperatures perhaps do not fall quite as low as in other locations with similar heating requirements, but the rainy season requires heat longer than in a drier climate. Portland has more than 17,000 homes heated with gas. Considering the fact that there are only 90,000 meters, the percentage is high. Most of the installations are warm air. Many are of the unit heater principle, that is, having several small furnaces supplying various rooms independently. The most important competitive fuel is wood. It is very low priced, the greater part of the cost being preparation and handling.

The northern part of California is supplied with manufactured gas. Heating, particularly around San Francisco and Oakland, is fairly successful. The peculiar climatic conditions, in regard to the fog which is prevalent in the early morning, makes heat a necessary part of almost every day of the year. Unit heaters of the furnace type, gas-fired radiators and radiant fires are popular. There are about 25,000 gas-fired central heating systems in use. The main competitive fuels are oil and brickettes which are compressed oil coke.

Southern California, in and around Los Angeles, is supplied with a mixture of natural and manufactured gas. Climatic conditions are well known. Gas is the predominating heating fuel. The unit system is extremely popular here. Heat generally is supplied to the various rooms only while they are occupied. The warm-air furnace is the most popular central heating system, about 40,000 being gas fired. More heating probably is done in this locality with gas-fired radiators and radiant heaters than with central systems. Large buildings, such as schools and movie studios, employ the unit system of heating. The chief competitors of gas are oil and electricity.

Briefly, gas heating is further advanced on the Pacific Coast than elsewhere. This may be attributed primarily to a climate which favors gas heating. Coal is not produced locally and is relatively high priced. Oil, while low priced and abundant, does not lend itself to the heating of residential buildings, particularly in the southern portion.

Note: DeGraw Apartments, Louisville, Ky., shown in the headpiece, are heated with gas-fired radiators.

Electric heating is more predominant here than anywhere else in the United States.

DEVELOPMENT SLOW IN MOUNTAIN STATES

Idaho has practically no gas heating. Absence of any number of large cities makes gas development very limited. Practically the only gas heating in Utah is at Salt Lake City where manufactured gas is supplied to few more than 100 heating plants. Arrangements recently have been completed to bring natural gas to Salt Lake City from the Baxter Basin in Wyoming, about 300 miles away. Intermediate communities then will be supplied.

Nevada has a few trial installations in Reno, but the use of gas for complete house heating amounts to little.

Wyoming has some natural gas, particularly in Cheyenne, where quite an amount of heating is done, but, aside from the natural gas region, the amount of heating with gas is nil.

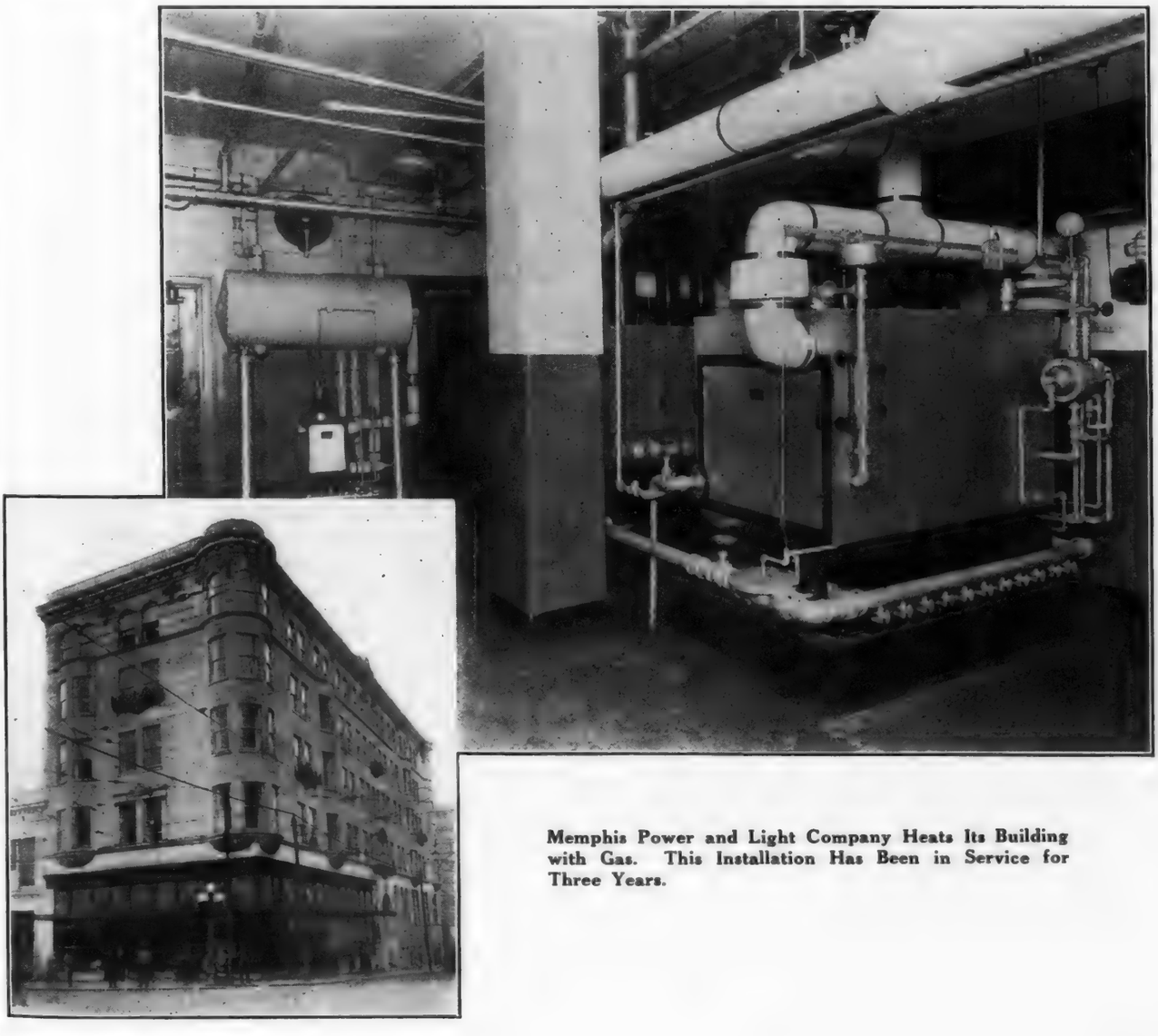
Arizona and New Mexico use practically no gas for heating, except along the southern borders.

Montana has what promises to be a considerable supply of natural gas in the western portion of the state. Some heating is being done especially in converted coal appliances. Helena now has natural gas and plans include connecting Great Falls and Butte. These cities and the intermediate towns will turn to gas heating when the pipe-line extensions are complete.

These last-named eight states are doing little or no heating with manufactured gas. Where natural gas is available, development in domestic heating is progressing slower than in other natural-gas regions. The cities in these states do not have the industrial institutions, the wealth, or the winter tourist population that stimulates gas heating.

DENVER MAY BE AN ALL-GAS CITY

Denver, Colo., was the first city to experiment with a low heat-unit manufactured gas at a low price. House heating was promoted actively on the principle of installing burners in coal boilers. Conversions, as these installations were called, are not now being advocated as enthusiastically as a few years ago. Warm-air furnaces designed for



Memphis Power and Light Company Heats Its Building with Gas. This Installation Has Been in Service for Three Years.

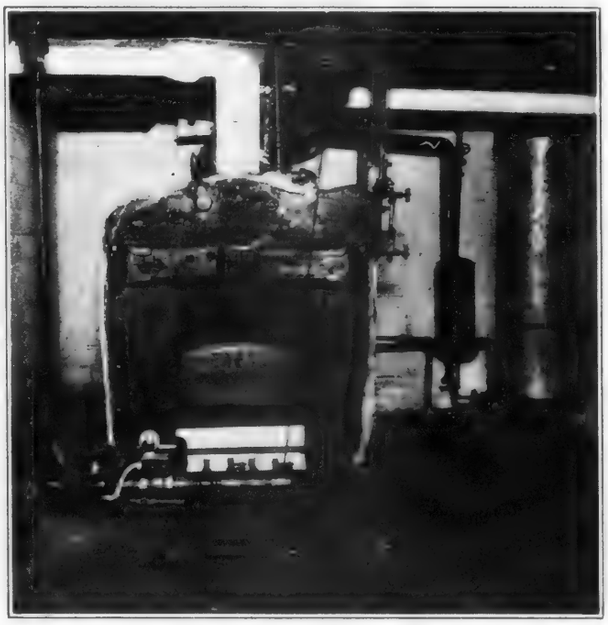
gas are now being used, as well as water and steam boilers. A local supply of low-priced coal is the chief competitor, with a noticeable amount of oil being used.

Gas from the Amarillo fields, nearly 350 miles away, soon will be brought into Denver through a 22-in. pipe line. It is expected that the supply of comparatively cheap gas will greatly stimulate gas heating. Denver is about the only place in Colorado where any notable amount of gas heating is being done at present. However, with the opening of the new pipe line from the Amarillo field in Texas to Denver, which will supply the intermediate cities of Pueblo and Colorado Springs and other smaller cities along the line, gas heating should develop rapidly, since all the preliminary educational work already has been done.

Natural gas from nearby wells is being piped into Fort Collins, where gas heating has had a favorable start.

TEXAS USES LOCAL FUEL

Texas now is largely supplied with natural gas. One of the largest natural-gas fields in the United States is located in the "Pan Handle." The estimated amounts of these resources were mentioned previously, and it seems only a question of time until the entire state will be supplied with natural gas. A pipe line is already underway to Galveston and the only two large cities not now supplied are Austin, which is the state capitol, and El Paso, situated at the extreme western point of Texas. The same conditions exist in Texas as in Oklahoma regarding the type of equipment used and competitive fuels. In all probability the use of central heating plants in residences is less prevalent, especially in southern Texas, than in Oklahoma, because of the warmer climate. A great many of the residences in this southwestern natural gas region are without basements which, of course, mitigates against the use of central heating plants and favors the unit system. In some localities, of which Houston is typical, the drainage problem more or less prohibits basements.

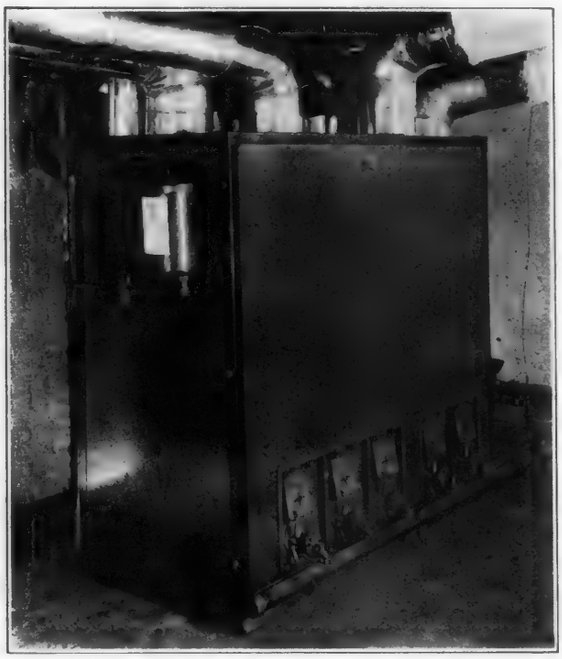


A "Conversion Job" in the Natural Gas Section—a Large Rectangular Boiler Fitted with a Specially-Designed Gas Burner

The greater part of Arkansas is supplied with natural gas. The largest city is Little Rock and conditions are very similar to both Oklahoma and Texas. In the manufactured gas portion no gas heating is sold as it embraces no large cities.

Louisiana is practically in the same position as the other territories which are supplied with natural gas, except that the southern portion has not been supplied with this fuel for any great length of time. In fact, New Orleans still has manufactured gas, with the prospects of a supply of natural gas within the next year or two. A large amount of manufactured gas is used in New Orleans for heating, mainly in appliances of the unit type. The extremely short season makes gas heating a problem for the producing company. Five times as much gas is used during the coldest weather in the winter as compared with the send-out during the summer months. This extreme peak has its disadvantages, but the wide variation cannot be entirely attributed to gas used for heating. There is a wide difference between the amount of cooking done in the winter and summer seasons. It is hoped that, with the introduction of natural gas, more industrial business can be secured, which will increase the base load and thereby reduce the percentage of the winter peak over the summer send-out.

Oil heating is popular in New Orleans and hot water is the usually accepted type of central heating system for residences. This probably is due to the



The Simplicity and Cleanliness of this Gas-Fired Warm-Air Heating Plant Should Appeal to the Average Home-Owner

fact that basements are more or less impossible, due to the low elevation of the territory and the consequent drainage problem. Hot water, therefore, is the most feasible central heating system to install in a residence without a basement.

Baton Rouge has just been supplied with natural gas which will probably be used to a large extent for heating. Conditions previous to its introduction were much the same as in New Orleans except that, there being less wealth, not as much gas was used for heating. Throughout the entire state of Louisiana wood residues, such as charcoal and sawmill waste, are common and inexpensive. Shreveport, commonly known to most baseball fans as the spring training quarters for the Chicago American League Ball Club, is an excellent example of a smokeless city. This city is in the neighborhood of a vast field of natural gas that is used for all heating purposes. Even the electric generating station of the Southern Utilities Company, located immediately outside of Shreveport, uses only gas as fuel. About the only smoke ever seen in this town is from the passing railroad trains.

In the Natural Gas Area Meters Frequently Are Placed Along the Road and Protected by a Simple Metal Cover

GAS LEADS AS DOMESTIC FUEL IN OKLAHOMA

The state of Oklahoma is supplied entirely with natural gas, which is the leading fuel for domestic heating. In large buildings oil is the main competitive fuel and since oil and gas are produced in the state they both are relatively low priced. For residential heating gas stoves are probably used in the greatest abundance. The usual procedure in residential building is to install gas piping for every room in the house. Some kind of heating appliance is then used in each room. These may be installed at the time the residence is erected, or may be left to the owner to select after purchasing a contract-built home. Some central heating is employed, generally gas fired, but the most popular type is warm-air. In the larger buildings, such as schools and in some office buildings, the idea of the unit heater is often employed, although the central system of heating is more common and oil more often is used.

The natural gas supply in this state is abundant and well regulated. Winter shortages are unknown, although an intense peak in gas consumed is developed during the extreme drops in temper-

(*Continued on Page* 84)

Roasting Breakfast Food in this Plant that Requires Nearly 400,000 Cu. Ft. of Gas Per Month

Heating Car Repair Shops

Unit Heaters for Large Open Areas and Cast-Iron Radiators in Offices and Small Inclosures Form a Satisfactory Solution of this Heating Problem

By W. H. Junker, M. E.

BOTH design and installation of mechanical equipment in the new car repair shops of the Cincinnati Street Railway Company offered some interesting and difficult problems. This article reviews the principal features of the heating system and of certain mechanical elements which are closely allied, all of which were designed, and supervised during construction, by the author.

THE shops of the Cincinnati Street Railway Company consist of three new buildings—the car repair shop, stores building and boiler house. All car repairing is done in a one-story building, approximately 400 ft. square, with lantern-type roof, except for a two-story section containing the shop offices, first aid rooms, toilets, locker room and cafeteria. The low point of the main roof is 22 ft. above the ground floor, and the distance to the top of the lanterns is 30 ft. This building accommodates all the departments necessary for complete overhauling and repairing of street cars and motor buses. The building is free from partitions except for the paint-spray, car-washing and sandblast rooms.

A two-story reinforced concrete structure 100 ft. by 140 ft. provides for general stores, including a stores-office section.

The boiler house is 60 ft. x 60 ft., 30 ft. high and accommodates the steam generating and sand-drying equipment. On account of high-water hazard, it was necessary to place the boiler-room floor on the same level as that of the repair shop.

THE STEAM GENERATING PLANT

Steam for heating is generated at 20 lbs. per sq. in. in two stoker-fired Tudor horizontal return tubular boilers set in battery, each nominally rated at 250 H.P. Two 4-in. safety valves on each boiler are set to blow at 24 lbs. and 25 lbs. respectively, and all four are connected to a common discharge pipe extending through the roof. A safety high-low water alarm column, an automatic feed-water regulator, and a soot blower are incorporated.

The stack is 5 ft. x 125 ft. constructed of radial brick.

Automatic feed-water regulators supply city water directly to the boilers. Compressed air at 100 lb. per sq. in., furnished by the large shop compressor, operates the soot blowers, since the avail-

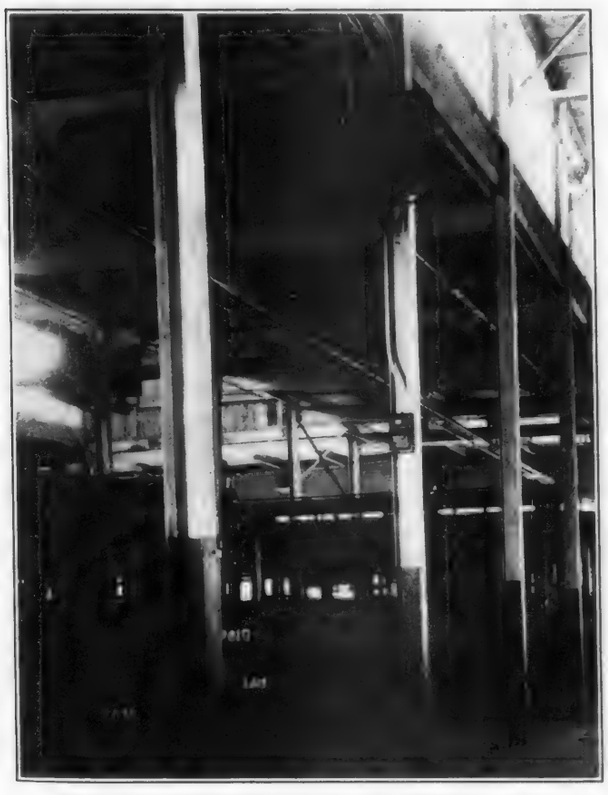
able steam pressure is not high enough to clean the tubes effectively.

Each boiler is equipped with a self-contained, underfeed, single-retort, side-dumping type stoker, mechanically and automatically operated by means of a 7½ H.P. rotor-wound motor, capable of 50% speed reduction. The speed control is accomplished by a hydraulic-operated automatic speed regulator, consisting of a regulating panel connected to the diaphragm of a pressure regulator. The steam pressure actuates the pilot valve of the hydraulic cylinder, the piston of which is connected to the armature resistor, thereby effecting automatic regulation of the stoker speed according to the steam pressure. The stoker is the "Jones" type and is capable of developing a continuous overload of 150% at an overall efficiency of 70%, without violating the smoke abatement ordinance of the city of Cincinnati.

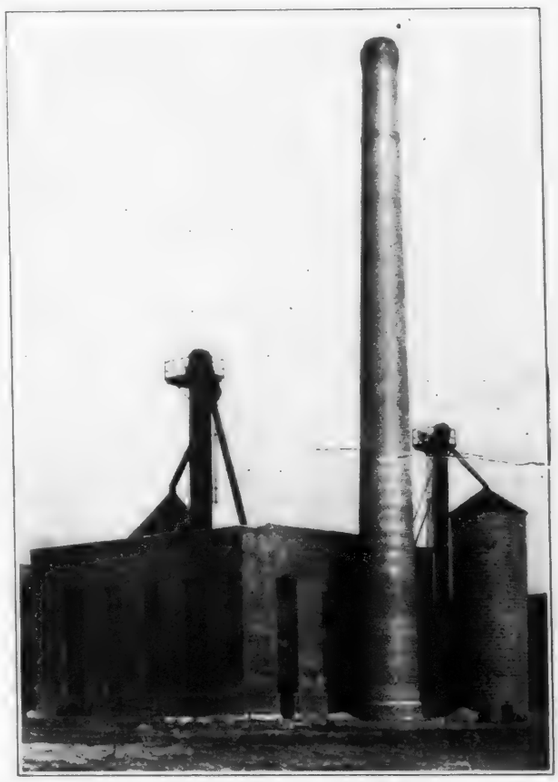
COAL AND SAND-HANDLING EQUIPMENT

The unloading equipment is an integral part of the boiler-house installation and is interlocked with the steam generating plant. It receives coal or wet sand from a 12 ft. x 12 ft. track hopper and feeds it, through an apron feeder, into the boot of a bucket elevator. The elevator is 80 ft. high and is capable of elevating 50 tons of coal or 25 tons of wet sand per hour. It is provided with a bifurcated discharge-chute with a flop gate to direct the material into either the sand or coal-storage bins.

Located above and in front of the boilers is the coal storage bin of 100-tons capacity, set at such a height, and with the supports so arranged, as not to interfere with boiler-tube removal. A bifurcated spout is arranged to deliver coal by gravity feed, and a second spout also delivers coal, by gravity, to the furnace end of the sand dryer.



Overhead Unit Heaters in Car Repair Shops



Boiler House Supplying Heat to Repair Shops of Cincinnati Street Railway Company with Dry-Sand Silo at Right and Coal and Sand Bucket Elevators Rising Above Roof Line

The wet-sand storage bin, located above and in front of the sand dryer, is of 100-tons capacity and feeds sand into the furnace end of the dryer by means of a revolving-table feeder and screw conveyor.

HOW THE SAND IS DRIED

A horizontal revolving-type dryer is provided with a series of lifting flights to shower the material through the hot gases. The dryer is capable of drying 2 tons of wet sand per hour and, in its operation, gradually moves the material toward the cooler end of the cylinder, where it is continuously screened and discharged.

This screened dry sand then is conveyed, by a screw conveyor, to the boot of a bucket elevator, where it is elevated to a storage silo, constructed of hollow tile, with an active storage capacity of 60 tons and a dead-storage capacity of 240 tons. Tailings, or gravel that does not pass through the screen, is elevated to a 20-ton storage bin.

Coal is used to fire the dryer during the summer months but when the boilers are in operation, their flue gases are used to dry the sand. This is accomplished by making a waste-heat connection from the boiler breeching to the dryer furnace. Circula-

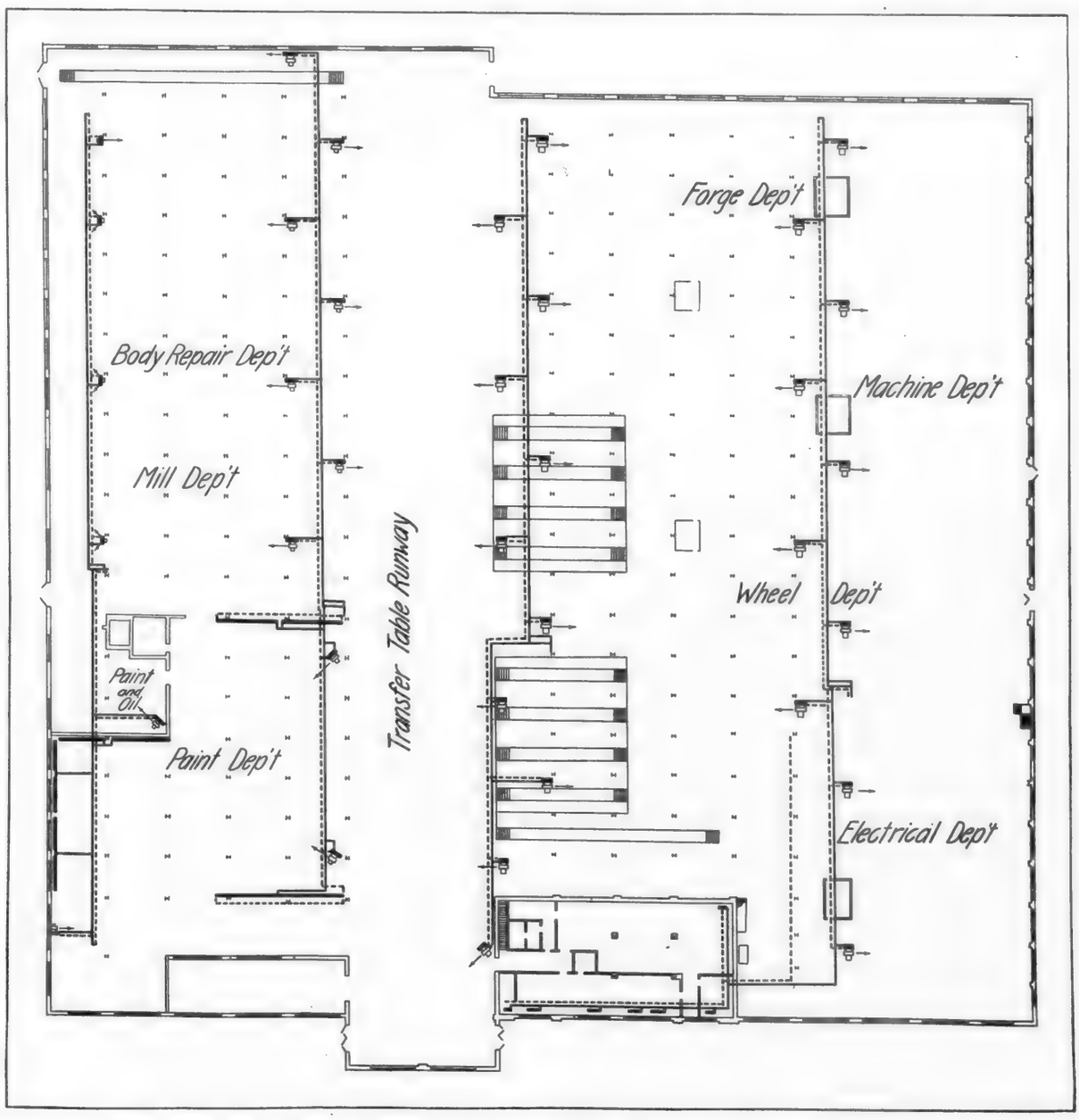
tion of flue gas through the dryer is effected by an induced-draft fan located in the smoke pipe of the dryer, and through the adjustments of dampers. The fan is capable of handling 4500 cu. ft. per min. at 500° F. against a static pressure of 1-in. Bearings are water cooled, and the fan is provided with a dampered by-pass which is used when the dryer is fired by hand. Flue-gas temperatures average about 450° F. and tests show that, by using this otherwise waste heat, a saving of 4 tons of coal per day is made in drying the sand. The sand is used for increasing traction on the tracks throughout the city in inclement weather.

HEATING SYSTEM

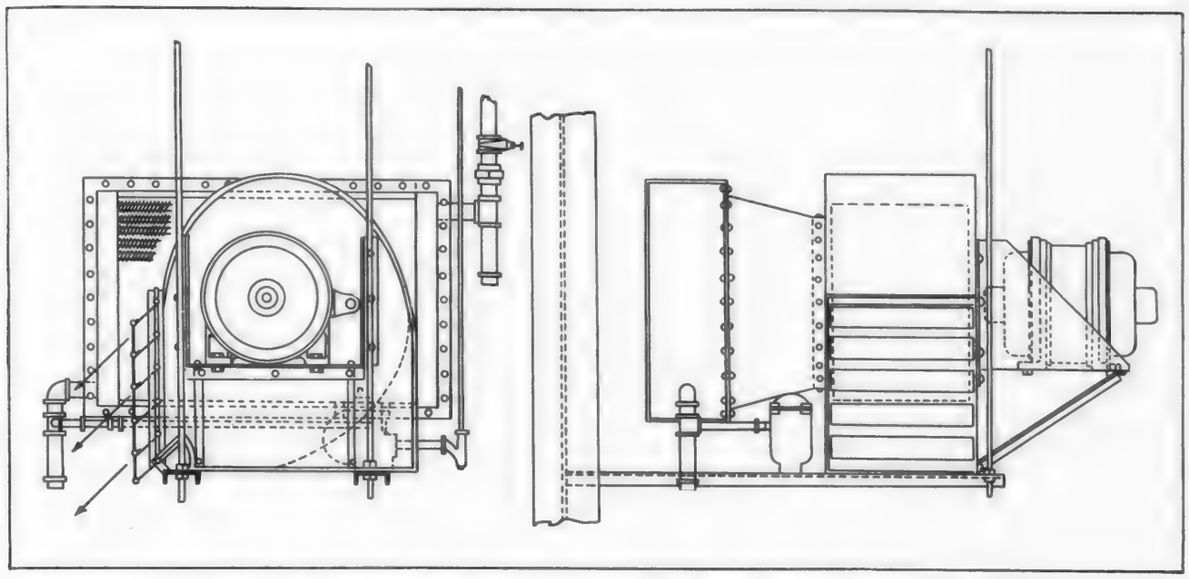
Steam, at boiler pressure, is distributed to the shop and store building through a system of mains located in tunnels. The shop main is 8-in. and is designed for a 4 lb. pressure drop at the farthest pressure-reducing valve. There are four of these valves in the shop that reduce the steam to 2 lbs. and feed into the low-pressure mains which are designed for a ½-lb. drop at the farthest unit heater. The steam main in the tunnel is provided with an expansion joint and is dripped into the return mains by means of high-low traps with intermediate cooling coil. All pressure-reducing valves are provided with valved by-passes.

Steam and return piping are installed as high as possible to avoid interference with plant operation, and a minimum of 18-ft. was allowed for the movement of street cars.

Total boiler load, including unit heaters, direct radiation, water heating and pipe losses, is equivalent to 60,000 sq. ft. of direct cast-iron radiation, of which over half is represented in unit heater



Plan of Car Repair Shops of Cincinnati Street Railway Company, Showing Disposition of Unit Heaters and Layout of Steam and Return Piping



Arrangement of Special Unit Heater (No. 1) to Handle 4800 cu. ft. of Air per Minute Delivering 277,600 B.T.U. per Hour.

Type No. 1. This unit, the heating elements of which are Aerofin, is used in the main shop where high installation was necessary.

The fan is of the single-inlet, single-width type, with horizontal discharge provided with adjustable louvres. The heating section is supported on the fan housing. Driving motors are equipped with ball bearings, which is of particular advantage, due to the inaccessibility of the motors, and oiling is necessary only once a year.

This unit heater is designed to make available, at full load, 277,600 B.T.U. per hour, moving 4800 cu. ft. of air per min., with an outlet velocity of 2100 ft. per min.

Unit heater type No. 2 is essentially the same as type No. 1, except that it is of reduced capacity.

Unit heater type No. 3 is used altogether in the stores building and at several locations in the shop where high velocity discharge was considered undesirable. In this type, the air is blown through the heating section by a propeller fan direct connected to the shaft of the driving motor. The discharge is provided with adjustable louvres set horizontally, except a few in the shop that are set vertically to avoid objectionable drafts.

Unit heaters were installed at the low points of the roof, alternately discharging in opposite directions across the roof lanterns where the greatest heat loss occurs. All heaters are dripped through ball-float traps with thermostatic by-pass and, due to the position of the return mains, it was necessary to raise the water of condensation through lift fittings from the traps.

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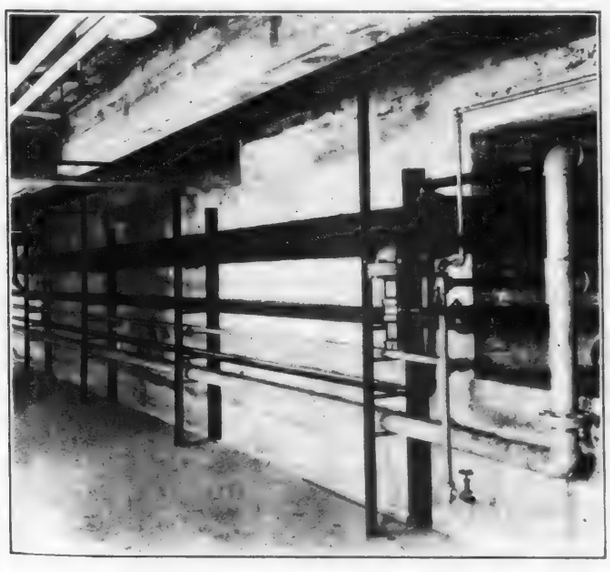
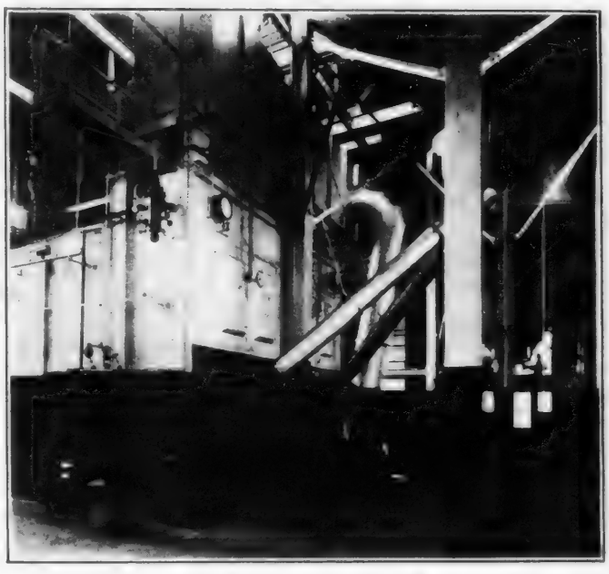
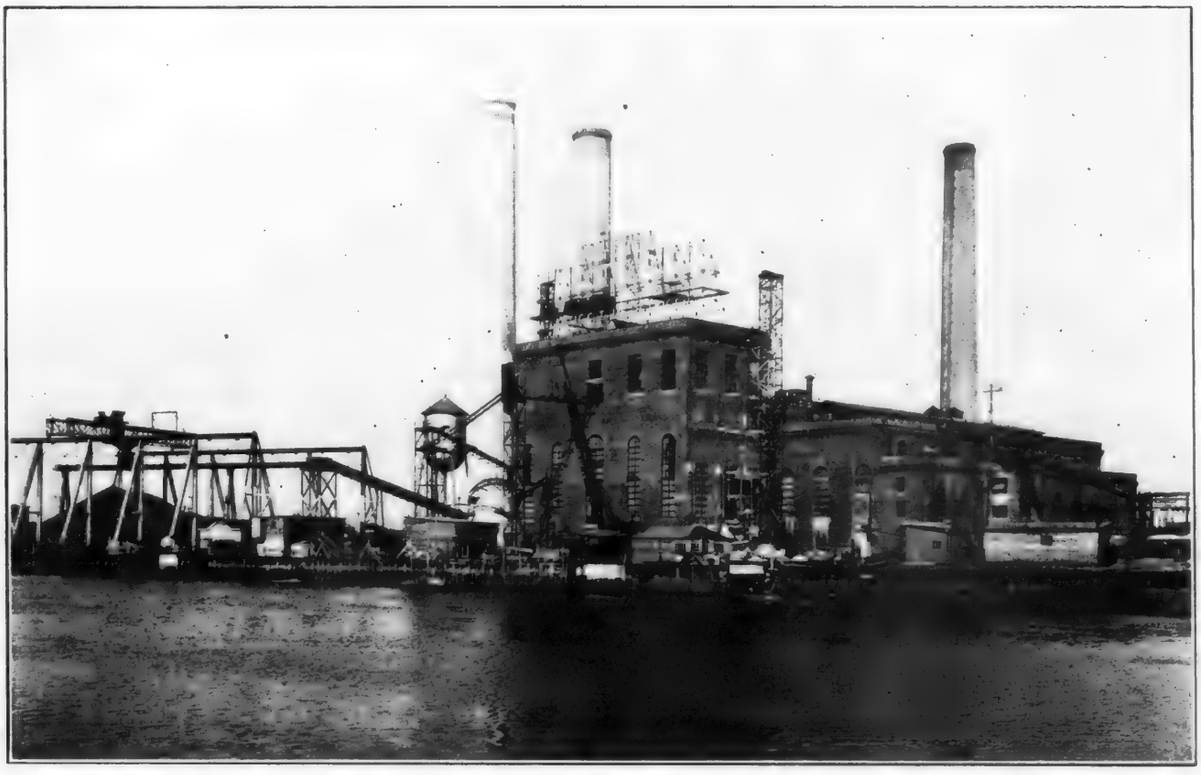


Interior of Tunnel Between Power Plant and Car Repair Shops Showing from Top to Bottom 8-In. Steam Main, 4-In. Vacuum Return, 2-In. Gas and 4-In. Water Pipes



Boilers, and in Background, Coal and Wet Sand Storage Bins and Sand-Drying Equipment in Boiler House of Cincinnati Street Railway Repair Shops



Plant of Atlantic City Electric Company in Which Water for District Supply Is Heated

The Status of District Heating

Part V—A Water Heating System That Has Survived a Quarter-Century Replete with Grief

By S. F. Delany

Superintendent, Hot Water Heating Department, Atlantic City Electric Company

MANY stories have been and can be written about district heating plants recently designed with consummate skill and constructed with the latest types of generating and distributing equipment. Successful and economical operation of such a utility is a foregone conclusion, based upon performance of many plants now in service.

Of more interest—and possibly of more value—is the story of the antiquated plant built a quarter-century ago, with no background to establish practice, consisting largely of untried equipment that failed partially or entirely. The rehabilitation of such an installation, and the grim struggle to keep from showing an annual deficit, furnished the plot of a paper read at the recent convention of the National District Heating Association, held in Atlantic City, June 12-15, 1928, and, because of the many valuable lessons brought out, the story, in slightly different form from its presentation, is included in this series.

TWENTY-SIX years ago a state charter was granted to the New Jersey Hot Water Heating Company, organized with the primary idea of supplying central station heat in Atlantic City. Almost simultaneously a franchise was granted by the city, and plans for the plant immediately were prepared. The prime promotor in the enterprise was Col. Isaac D. Smead, prominent in the heating industry of the time, who had designed and operated a district heating plant in the suburbs of Toledo, O.

As this form of heating then was in its infancy, only meager data were available upon which to base plans, and many of the ideas incorporated in the original layout were personal conceptions of the promotor, or were decided upon by local investors after inspection trips of investigation. The system, designed by Colonel Smead, provided for a two-pipe hot water system and the first plans contemplated the use of wrought-iron pipe. Previous to that time wood pipe had been used for cold-water distribution in various cities, and the exhibition of a section of wood main removed from the site of

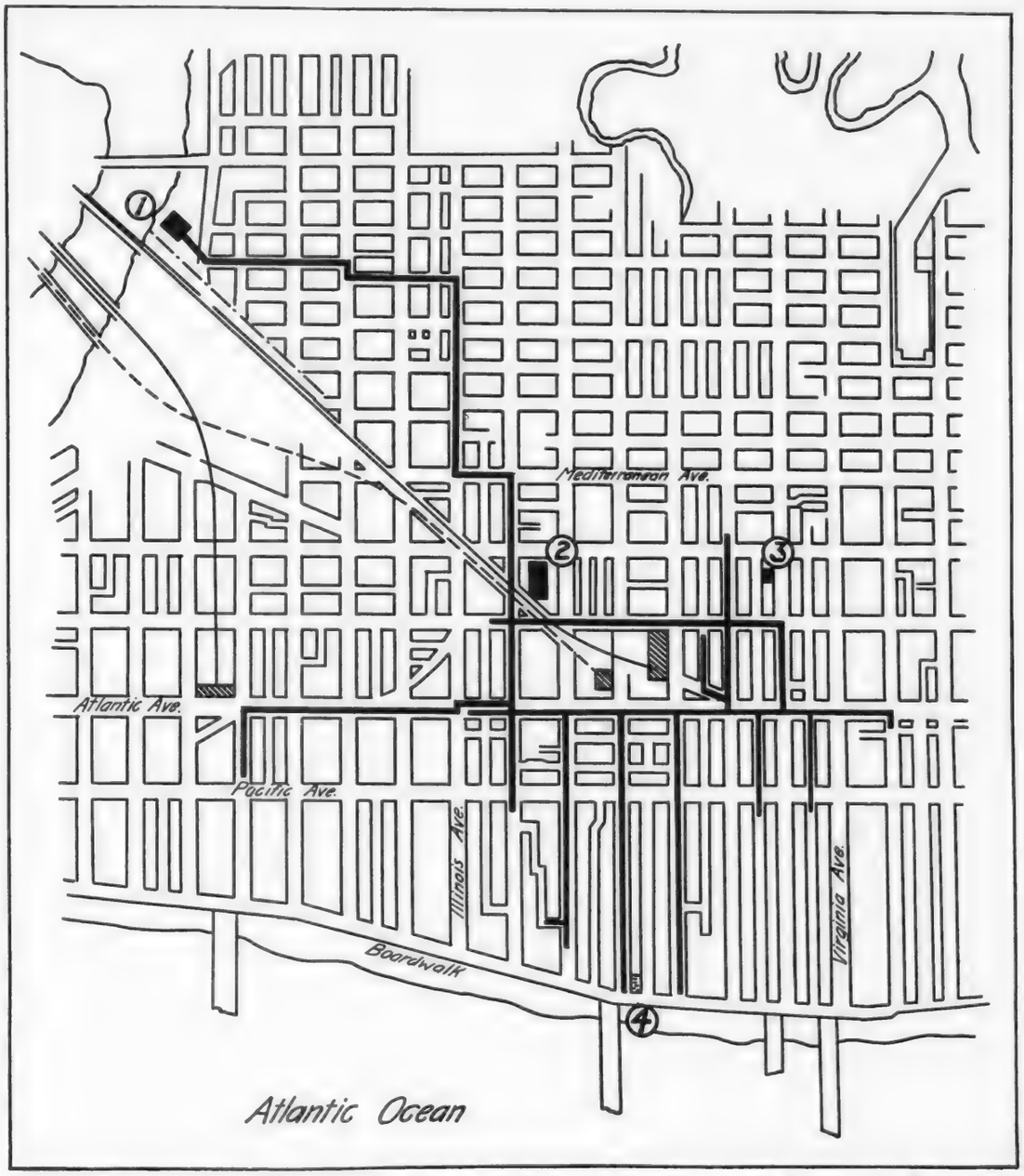
the present City Hall in Philadelphia, with the explanation that it had been in the ground and in service for over a hundred years, decided the officials in favor of wood pipe.

Conforming to the ideas of Colonel Smead, two boilers of special construction were built. These were 62 ft. and 72 ft. in height, respectively, each boiler acting as its own smoke-stack. Each had an 18-ft. fire-box and was built in a series of tiers of 12-ft. height, the boiler tubes extending vertically along the walls of the boiler. An open container was used as storage for the return water, which was pumped to the top of the boiler by two steam pumps, each rated at 150 H.P. Supply connections were taken from the bottoms of the boilers.

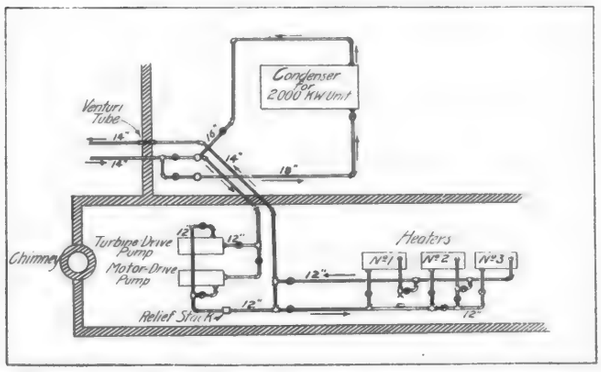
Mains leading from the plant were 8 in., reduced in some places to 6 in. No expansion devices were used in them as the manufacturers of wood pipe claimed that they were unnecessary. Service connections were obtained by boring and tapping holes in the main and placing wrought-iron banded saddles on either side of the service connection, using red lead and hemp as packing.

In an effort to obtain patronage, the company did all piping on the consumer's premises at nominal prices and approximately 60 consumers were on the system when it started operation early in March, 1903. The total cost of the plant and underground construction was $355,000.

While successful from an operating standpoint, the first season was an unqualified failure from a financial point of view. During the second season,



Map of Downtown Portion of Atlantic City, Showing District Heating System of Atlantic City Electric Co. (1) Main power plant, (2) Present modern pumping station, (3) Location of original heating plant, (4) Boardwalk arcade with 30,000 sq. ft. of radiation.



Heater and Plant Piping Arrangement, Atlantic City District Heating System

it was found that the extreme high temperature had softened the wood mains to such an extent that leaks were numerous, and operating costs mounted rapidly. At the end of this season—a very unsuccessful one both from financial and operating standpoints—it was decided to replace the wooden pipe with wrought-iron pipe. The new mains were covered with a heavy layer of felt and boxed, the box being filled with pitch and sawdust. Traverse expansion joints were used throughout.

MODERNIZING THE SYSTEM

A radical change was made at the boiler plant where a 1250 H.P. Scotch boiler was installed, feeding a series of heaters with steam. A new set of pumps also was put in and these changes cost approximately $110,000. Pressure carried on the system was 48 lbs. and the water temperature was regulated to correspond with the varying outside temperatures. A flat rate of 20c per sq. ft. of required radiation was charged.

After about a year of operation, the local electric company purchased the heating plant and, after one season of operation, moved the plant to the site of its generating station, now the site of the service station. Having an abundance of exhaust steam at this plant, it was found more economical to use exhaust steam heaters. The main distribution point was changed and the system was considerably extended.

During the summer of 1910, the location of the generating station was changed, necessitating another extension of the mains. In crossing one avenue, it was necessary to drop down 17 ft. to clear a storm-water drain, which, at that time, the company was not allowed to go through. Practically the same method of heating the circulating water was used in the new plant as in the old, but the equipment was entirely modern, in that turbines replaced the old reciprocating engines. In the old plant, it frequently had been necessary to inject live steam into the heaters to procure the necessary temperatures, but in the new plant such deficiencies were met by bleeding steam from certain stages of the turbines. Centrifugal pumps, one directly connected to a steam turbine and the other motor-driven, replaced the old piston pumps. The heating equipment consisted of three cylindrical type horizontal closed heaters, each with 260 3-in. tubes, through which the circulating water was driven, the condensate therefrom being used as boiler feed-water.

For the next 14 years, few changes were made.

HIGH WATER LOSSES LED TO REHABILITATION

Operating conditions at this time were not in any wise favorable. Water losses were very high. Two lines, a 2-in. and 1½-in. were required, discharging their contents wide open into the return line as make-up water, naturally causing a tremendous drop in temperature. The average temperature of the return water was 130°, while the temperature of the make-up water was approximately 60°. Poor circulation, due to water losses, forced the maintenance of a much higher temperature in the supply mains than was necessary. At this time, the first step was made to use a surface condenser as a heater. It was not possible to maintain a constant pressure, and in severe weather it was necessary to pass water through a series of heaters after leaving the condenser in order to obtain the necessary temperature. This added to the already overburdened operating expenses.

Several customers were receiving such poor service that it was decided to open their return lines into the sewer; one installation with 15,000 sq. ft. of radiation was forced to do this, as were several smaller installations. The largest had two ¾-in. discharge lines, while the smaller were practically ½-in. discharge, all these pipes being open 24 hrs. a day.

Three buildings found it necessary to use pumps to secure the proper circulation, due admittedly to poor internal piping arrangements rather than to distributing line conditions. Unfortunately, two of these pumps were located at the dead ends of two of the largest mains, while the other pump was located directly in the center of the system. All of the customers above the two pumps in the ends of the line and also the customers above the pump in the center of the system received such poor service that, for a time, there was a possibility that all of the consumers would install their own plants in the affected district.

Several types of consumers' installations were in operation, and little or no consideration had been given to the piping arrangement. Any type of system was taken on in an effort to increase revenues and the result was a hodgepodge.

HOW LOSSES AND UNSATISFACTORY SERVICE WERE DECREASED

To correct these existing conditions the first thought was to eliminate all water losses. This was no easy job as the consumers who were discharging their returns to the sewer were among the oldest on the line. One company, the largest of the affected installations, indicated a willingness

to co-operate by installating its own plant as it was told that it could not adequately heat its building because of the conditions described. During the next season the water losses at the plant were decreased until water was maintained with a ¼-in. line, cracked open.

ELIMINATING THE TROUBLE-MAKING PUMPS

The next thought was to eliminate pumps where possible. A pump located at the City Hall, which had been the greatest trouble maker was, after two years of discussion, abandoned and the piping system in the municipal buildings re-piped. Since this was done, these buildings have been heated adequately and the service to customers beyond this point has been improved greatly. The second pump was removed in 1926, and the last one still is in operation but causes very little trouble.

Another step was to check all consumers' premises to determine if they were being correctly charged for their radiation. The result of this checking was astounding. It was found that practically 75% of the consumers were underrated, ranging from 10% to over 50%. Fortunately, relations with customers were such that this difficult task was carried out and the increase in gross revenues was over $15,000.

During that year a survey was made of all customers' piping arrangements and to each was presented a report outlining existing conditions and making suggestions for their corrections. This plan also bore fruit and many poorly piped installations were corrected. Today all piping layouts must be approved by the heating department before connections will be made.

PRESENT METHOD OF HEATING WATER IS ECONOMICAL

By using the hot water as condensing water in the present 6000-sq. ft. surface condenser, practically turning the condenser into a water heater, there has been produced an ideal and efficient heating unit. At times this unit is run practically as a condensing unit and during the average cold or severe weather as a non-condensing unit discharging all of its steam into the condenser and heating the water for the system. The turbine acts as a regulator for the heating system, running under a partial vacuum as the demand for heat varies. There is a sufficient day load to give all the heat required by the system. The condenser box was especially designed and built with four openings for 16-in. gate valves, and the arrangement of these valves is such that, should it be desired for any reason to cut out the turbine condenser method of heating, the water for the heating system can be diverted from the condenser to the heaters and the condenser can be run in the regular way, using sea water for cooling.

Tests made during the heating season of 1925 showed that this use of the condenser effected an economy of approximately 9 lbs. of steam per K.W.H. against the use of bleeder steam.

Heating Car Repair Shops

(*Continued from Page 75*)

The office section and paint-spraying department are heated by direct radiation, the latter being supplemented by unit heaters in extremely cold weather. Radiators are set near the floor, and their condensation is lifted, in some cases, to a height of 22 ft. into the return mains by a series of lifting stages.

PIPING AND BOILER FEED

All overhead return mains are collected together and enter the main return in the tunnel, which is carried to the pipe well in the boiler room and terminated in a 6-in. header. The vertical lift from this header to the suction strainer of the pump is 12-ft. and all water of condensation is lifted through three lifts, each lift having three stages. Each lift is separately valved for the purpose of control under varying load conditions.

Condensation is returned to the boilers by a duplex vacuum and boiler-feed pump, automatically controlled. Each pump is direct connected to a 10 H.P. motor and is capable of handling 90 gal. per min. against a discharge pressure of 30 lb. per sq. in., while maintaining a vacuum of 10-in. of mercury. Due to the flood-water hazard it was necessary to place this pump in the boiler room, although a more favorable operating position would have been in a basement. The pumps operate automatically between 6-in. and 11-in. of vacuum, this range being necessary on account of the unusual lifts in the system.

Temperature in the shop and stores building is automatically controlled by means of thermostats placed on columns approximately 50 ft. distant from each unit heater. Temperature adjustment is made by a key, and the thermostat controls only the pilot circuit of the magnetic starters for the unit heaters. This pilot circuit is 110 volts whereas the operating voltage of the motors is 440 volts. A key-operated toggle switch is installed above each thermostat and connected for manual operation of the units to provide air circulation during the summer months when the temperature is above the thermostat limit.

In addition to the thermostatic control of each unit heater the entire installation is fed by a separate power feeder controlled at the main switchboard through an oil circuit-breaker. The heating system thus can be shut down after working hours by the operation of the master switch.

From a standpoint of heating efficiency, this type of system has well met the requirements. Temperature readings taken during extreme cold weather show only 2° difference between the roof and floor. This kind of installation usually costs between 25% to 40% less than heating systems with wall or pipe radiation and, because of ease of control and maintenance of constant temperature, it seems well adapted to applications of this kind.

Heating and Ventilation Specifications

Part IV—Drawings, Shop Drawings, Discrepancies

By Harold L. Alt

IN order to unite the drawings illustrating the work with the specifications defining the labor and materials to be used in the work, a special paragraph is needed; this paragraph is used to designate what drawings form part of the contract and what functions they perform.

Such matters as the preference of figured over scaled dimensions, and the superseding of general arrangements by details also are covered. These matters, as well as the charges for extra sets of prints, are all defined in GC-8.

Specification No. 1 for a high school in Wilmington, Del., by a Newark, N. J., architect and engineer, in connection with the matter of drawings, reads:

CONTRACT DRAWINGS:

It is understood that the drawings accompanying these specifications are intended to show the general arrangement and extent of the work to be done, but the exact location and arrangement of all parts shall be determined as the work progresses, to conform in the best possible manner with its surroundings, the work in all its details being subject to the approval of the Architect whose decision on all points of difference shall be final and binding on this Contractor. Any work or materials which are rejected must be replaced immediately by this Contractor.

The drawings and specifications mutually explain and illustrate each other, and the requirements of either, although not specifically mentioned or shown by the other, shall be incorporated in the work of this contract.

The locations of equipment, piping, outlets, etc., as given on the drawings are approximately correct, but it is understood that they are subject to such modifications as are required in order to meet any structural conditions. Such changes shall be made by this Contractor without extra charges.

On this point Specification No. 2, for an office building in New York by a New York architect and engineer, reads as follows:

PLANS AND DRAWINGS: The following drawings accompany these specifications:

(List given here)

Also the architectural and steel-framing drawings as to dimensions and details of treatment.

The plans are diagrammatic to some extent, but all pipes shall be run as closely as practicable as shown thereon and no deviations therefrom will be permitted without the written consent of the Consulting Engineers.

GC-8 DRAWINGS:

The work included in this contract is based on the following drawings which form a part of this specification:

Drawing No.	Description or Title
. . . . .	. . . . .
. . . . .	. . . . .

(Complete list of drawings here)

The necessary drawings for filing with the building or other local departments for the issuance of building or other permits will be furnished to this Contractor by the Engineer (or Architect).

(Note: If these are to be paid for by the contractor add) at a cost of. . . . . for each complete set and a pro rata charge for each portion of a complete set.

(Note: Usually these are furnished without charge).

These drawings and specifications shall be used for this work only, and, as instruments of service, they shall be returned to the Engineer (or Architect) before final certificate of payment is made. Two sets of drawings and specifications will be furnished to the Contractor by the Engineer (or Architect), the Contractor assuming the expense of extra sets, if required, which extra sets shall remain the property of the Engineer (or Architect).

The Contractor shall keep in good order on the work one copy of the specifications and one copy of each drawing, and the representative of the Engineer (or Architect) shall have access to such drawings and specifications.

It is understood that the drawings accompanying this specification are intended to show the general arrangement and extent of the work to be done, but that the exact location and arrangement of all parts shall be determined as the work progresses, to conform in the best possible manner with the surroundings, the work in all details being subject to the approval of the Engineer (or Architect), whose decision on all points of difference shall be final and binding on this Contractor. Any work or materials rejected by the Engineer (or Architect) must be removed immediately and replaced by this Contractor.

Figured dimensions shall be followed in preference to measurements by scale, and large scale drawings shall take precedence over those at smaller scale. This Contractor shall give to the General Contractor all necessary information, dimensions and locations of openings, holes, lintels, etc., required for apparatus, ducts, registers, pipes and other parts of the Contractor's work as required.

Specification No. 3, for a high school in St. Louis, Mo., by the school architect, is much more elaborate on this point involving, as it does, the following provisions:

DRAWINGS AND SPECIFICATIONS:

These specifications and accompanying drawings are to be interpreted according to their full intent, meaning and spirit, whether taken together or separately. Taken together they shall be deemed to mutually explain each other and to be descriptive of the work to be performed under the contract for this building. But should there be any discrepancy between the drawings and specifications, or between the figures on the drawings and the scale, or between the larger and smaller scale drawings, or between the descriptive writings on the drawings and the code designating the materials, the word of the specification shall take precedence in all cases.

The figures on the drawings shall be taken in preference to the scale, the details or larger scale drawings shall be followed in preference to the smaller scale drawings, and the descriptive writings on the drawings to the code. Should there be anything shown on the drawings and not described in the specifications, or described in the specifications and not shown on the drawings, the same shall fully be executed and carried out as if drawn, shown or described in both, and the contractor is not to make any alterations or corrections on the drawings or in the specifications; should any error appear the same is to be referred to the Commissioner for correction before the bids are submitted or the work proceeded with.

These drawings and specifications are the property of the Board of Education of the City of....., and are to be used for this work only. The contractor is to take reasonable care of the same, and is to return each and all of them in reasonably good order to the office of the Building Department before the final payment is made on the contract.

The drawings illustrating these specifications are the following:

(List given here)

Together with such further drawings as may be necessary to fully explain the intention of the Commissioner.

In Specification No. 4, for a high school in Columbus, O., by a Chicago engineer, is found the following paragraphs:

DRAWINGS:

The drawings prepared for the purpose of this figuring are an outline to show where certain pipes, ducts, etc., must go in order properly to avoid, and to harmonize with, the pipes and ducts of other contractors. The contractor shall check over these drawings carefully and may submit a suggested layout of any portion of the work that may appear to improve the efficiency of the system. If such changes are approved, they shall become a part of this contract after their approval. Such approval is limited only to approval for conformity with the general requirements of the drawings and specifications, and does not relieve the contractor of responsibility for the proper operation of the system.

Should the contractor, in going over the drawings, recognize any points which seem to him to be insufficiently or improperly cared for, to the extent of jeopardizing the guarantee which is required of him, he shall state such a situation along with his proposal, and shall state what addition or deduction, if any, would be made in his proposal for the work as regularly specified, if such defects were remedied by him in such manner that he could guarantee the entire installation as required.

In Specification No. 5, for a New York high school, prepared by the Board of Education, City of New York, drawings are covered by three paragraphs as follows:

DRAWINGS:

(a) All plans and drawings shall be the property of the Board of Education, and as such shall be subject to the control of the Superintendent, and shall be returned to him at the completion of the several works if he shall so require.

(b) Four (4) sets of drawings (if any) and two (2) sets of standard and special details, applying to the respective work, will be issued to the Contractor.

(c) DETAILS—The drawings and specifications shall carefully be examined by the Contractor for the purpose of ascertaining whether or not he is in possession of the necessary scale and full-size details embodying the work shown, indicated or called for. Failure to apply at the proper time for details of any work so indicated shall not release the Contractor from constructing same in accordance with details. Wherever the words "Drawings" or "Plans" are herein used same shall be taken to include plans, elevations, sections, scale and full size drawings.

Specification No. 6, of a high school in Orion, Mich., prepared by a Detroit architect and engineer, does not seem to take the matter of drawings very seriously, for it says:

DRAWINGS:

No drawings are to be submitted to the Engineers in connection with the mechanical equipment unless specifically called for by them or required by this specification, except for equipment named in the next paragraph.

Special equipment such as boilers, heaters, air washers, pumps, electrical appliances, automatic valves, dampers, filters, fans and auxiliary equipment, must be installed in a manner approved by the manufacturer of such equipment and subject to the approval of the Engineers.

The matter of drawings to be made by the Contractor is next taken up; the drawings are described and it is made obligatory on the Contractor's part to bring to the attention of the Engineer or the

Architect as the case may be, any variation from the original ideas. This is clearly set forth in GC-9, as well as the time when such drawings must be submitted.

GC-9 SHOP DRAWINGS:

The Contractor shall furnish in quadruplicate to the Engineer (or Architect) such shop and setting drawings or diagrams, dimensioned and in correct scale, as may be required to make clear the work intended or to show its relation to adjacent work or to the work of other trades. The Contractor shall make any changes in such drawings or diagrams as are required, and shall submit four copies of the revised prints for approval.

In submitting such shop and setting drawings the Contractor shall in writing, specifically call the attention of the Engineer (or Architect) to every change from the contract drawings or specifications. The approval of the Engineer (or Architect) on the revised prints shall not relieve the Contractor from all responsibility for his own errors or for changes not so pointed out in writing. All such drawings must be furnished at such date prior to the installation of the apparatus as not to delay the progress of the work or the work of other Contractors.

Specification No. 1 requires:

SHOP DRAWINGS:

The heating and ventilating Contractor shall furnish in triplicate to the Architects for their approval such shop and setting drawings or diagrams as may be required to make clear the work intended or to show its relation to adjacent work or to the work of other contractors.

The heating and ventilating Contractor shall, in writing, call the Architect's attention to every proposed change from the contract drawings and specifications. The approval of the Architects on such shop drawings will not relieve the Contractor from all responsibility for his own errors or for changes not so pointed out in writing.

Specification No. 2 is much briefer on this point, consisting of only the following:

This contractor shall submit detail drawings in triplicate for the approval of the Consulting Engineers of the following apparatus within ten (10) days after the signing of the contract. When these are approved he shall furnish the Consulting Engineers with three (3) copies of each drawing:

1—Fan and motor.
2—Vacuum pumps.
3—Shop drawings of ventilating ducts.

Specification No. 3, although short, includes a considerable number of drawings:

DRAWINGS:

Before proceeding with the work, the contractor shall submit for approval of the Commissioner, detailed working drawings in quadruplicate of all fans and motors, air washers, all pumps and foundations, casings, dampers, hot water generators and all other apparatus not detailed in this specification.

Specification No. 4 itemizes the shop drawings desired and also includes any others "which may be found necessary." It reads:

SHOP DRAWINGS:

The Contractor shall submit scale shop drawings in triplicate, one of which will be returned to him, for the following items and others as may be found necessary.

Boilers and boiler foundations.
Fans.
Breeching.
Tempering heaters.
Pumps and compressors.
Receiving tank.
Hot-water heaters and hot-water storage tanks.
Gauge board and its supports.

Should the Contractor need additional copies other than the one for his files, as for the manufacturer, his foremen, etc., they will be returned with approval noted thereon, if submitted with those above mentioned.

See "Shop Drawings" in General Conditions.

Specification No. 5 goes into the matter of shop drawings in considerably greater length, and requires them to be submitted in quadruplicate as will be seen in the paragraphs quoted below:

SHOP DRAWINGS:

Shop drawings, in quadruplicate (see Par. 60), unless otherwise specified, shall be furnished to and approved by the Superintendent before any of the work is commenced for which such drawings are required. Shop drawings, where required, are for the purpose of supplementing the contract drawings and shall not show material deviation therefrom.

The approval of shop drawings shall be general, and shall not be taken as indicating that said drawings have been checked, nor shall the approval in any way relieve the Contractor from the responsibility of the proper fitting and construction of the work in strict accordance with the contract requirements, or from the necessity of furnishing materials and workmanship required by the contract drawings and specifications which may not be indicated on shop drawings when approved. Any materials which are not in accordance with the contract drawings and specifications must be clearly indicated, and a specific and separate request for the approval of such materials shall be made in each case.

Each delivery of shop drawings shall be accompanied by a letter of transmission giving a list of the numbers of the drawings. All drawings shall be marked with the name of the building and numbered consecutively. All drawings must be checked and be complete in every respect, and bound in sets before forwarding same to the Superintendent.

From the various provisions included in the six

specifications under analysis it seems to be a pretty well established fact that it is the custom to list the drawings forming part of the contract in the specifications; also to demand, from the contractor, shop and detail drawings of various portions of the work which may not be covered particularly in the original layout.

Owing to the fact that everything cannot be shown and called for on a set of drawings and that the specification is limited to the thought conveyed by the wording, it is often necessary to have one overlap the other, or there may be a small gap left open between the point where the specifications end and the plans begin. In still other instances the specifications may give a general provision which, in a few isolated instances, it may be impossible or impractical to carry out. Or a special case may arise where it is absolutely necessary to do something indicated on the plans that is expressly forbidden in the specifications.

With the assumption that the contractor knows his business, and has allowed a sufficient sum in his estimate to do the job properly, it will not be any hardship for him to carry out his contract on these minor points in accordance with the decision of the Architect or Engineer who is presumed to have the good of the job as his sole consideration. The paragraph given in GC-10 covers this matter briefly but prohibits the Contractor from proceeding with his work, when doubtful as to just what is desired, except after obtaining instructions from a proper source.

GC-10 DISCREPANCIES:

In case of any difference between the drawings and specifications, or where the drawings and specifications are not clear or definite, the subject shall be referred to the Engineer (or Architect) for decision, and without such decision adjustment shall not be made by the Contractor save at his own risk.

Specification No. 1 goes into this subject more in detail, as given below:

DRAWINGS AND SPECIFICATIONS:

Drawings and specifications are intended to agree and be mutually explanatory and shall be accepted and used as a whole and not separately. Should any item be omitted from the drawings and be herein specified, or vice versa, it shall be executed the same as if shown and contained in both.

Should contradictions be found, definite provisions of the specifications will be preferred to varying requirements of the drawings, except that should provisions of the drawings, in note or otherwise, be the more complete and show work and materials more suitable for the position and such as to form the more reasonable basis for estimating, then, upon decision of the Architects to such effect, such drawings shall have preference in authority.

Specification No. 2 does not cover this item because it refers back to the General Condition of the General Contract. Specification No. 3 handles this matter somewhat differently, calling the paragraph "Interpretation" and reading as quoted:

INTERPRETATION:

Reference must be made to the drawings for all measurements. The measurements given on the plans shall be checked by the contractor before proceeding with his work and any discrepancy shall be reported at once to the Commissioner. Should it appear that work intended to be described, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings, or in the specifications, contractor shall apply to the Commissioner for such further drawings or explanations as may be necessary and shall conform to the same so far as they shall be consistent with original drawings, and in the event of any question arising respecting the true meaning of the drawings and specifications, reference shall be made to the Commissioner, whose decision shall be final and conclusive. In no case shall a bid be submitted, or any work be proceeded with, in uncertainty.

Specification No. 4 refers back to the Architects' General Conditions and so does not cover this point.

Specification No. 5 wraps up this item very delicately under the heading "Scope" which is given herewith:

SCOPE:

It is the intention that these specifications shall provide for..... (described work)..... complete in all parts, except such portions of the work as are not provided for in these specifications. Any work not particularly described in the specifications, or any work which may evidently be necessary to complete the specified..... (described work).....shall be furnished by the respective Contractor as being included in his contract. Any doubt as to the meaning of these specifications, or any obscurity in the wording shall be interpreted by the Superintendent of Plant Operation, who shall give all directions or explanations required or necessary to complete any of the provisions of these specifications and the drawings, and to give them due effect.

Specification No. 6 is very complete on the subject and does not intend to allow the Contractor much chance of overlooking any item on the plea that it was not included in the specification. Witness:

PLANS AND SPECIFICATION CO-ORDINATION:

This specification is intended to supplement the drawings and therefore it will not be the province of this specification to mention any portion for the work which the drawings are competent to explain, and such omission is not to relieve the Contractor from carrying out such portions only indicated on the drawings,

and should items be required by the specifications not indicated on the drawings they are to be supplied even if of such nature that they could have been indicated thereon. Any items which may not be indicated on the drawings or mentioned herein, but are necessary to complete the entire work, must be supplied in place.

Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or in the specifications, the contractor shall apply for such further drawings or explanations as may be necessary and the Contractor shall conform to the same as a part of his contract, so far as they may be consistent with the original drawings.

No alleged oral admission or condemnation or inadvertent neglect on the part of the Engineers will be taken as an excuse for bad work.

(*To be continued*)

Gas Heating for the Heating Contractor

(*Continued from Page* 71)

ature that come within a few hours in this region and farther south. The sudden change in temperature creates a wide variation in the heating requirements which can be met with gas easier than with any other fuel.

Nebraska with two relatively large cities—Lincoln and Omaha—has just started to promote gas heating, and plans are on foot to pipe in natural gas from distant fields. A few installations are now in operation in Omaha.

North and South Dakota are supplied entirely with manufactured gas. Practically no central heating is done in these two states. The absence of any large industrial centers is responsible for practically no industrial gas-heating business and, as the use of gas is more or less confined to domestic uses, the price is higher than in more thickly populated regions. Some supplementary heating is done with radiant heaters and similar devices but, at the present time, these two states present practically no outlet for gas heating.

In Kansas the gas supply also is partly manufactured and partly natural. Natural gas is supplied to the greater portion of the southeastern section. The north and western regions are supplied entirely with manufactured gas. In this section there are no cities of any considerable size and gas is not used for heating, except in auxiliary appliances. In the natural-gas region a considerable amount of gas is used for domestic heating, especially in Wichita, Kansas City, and Topeka. Few central heating plants designed for gas are used, however, as most of the gas is burned either in coal-designed equipment, or in unit heaters. A great variety of appliances known as gas stoves is used. The term "gas stove," as used in the natural-gas region, does not mean a cooking stove, but is intended to mean a heating device which takes a great many different forms. The local supplies of natural gas for Kansas have largely been depleted and now the greater part of the gas is brought from outside of the state, particularly from Oklahoma.

SOUTH OF THE CONVENTIONAL HEATING ZONE

Very few gas-fired heating systems are installed in any of the southern states east of the Mississippi, with the exception of Florida. In Newport News and Portsmouth, Va., and at Knoxville, Tenn., a start has been made. Gas heating practically is unknown in North and South Carolina, Alabama and Mississippi. In Georgia there are several hundred central heating plants—mostly coal furnaces, converted to use gas. This area is supplied with manufactured and by-products gas, excepting the small region in the northeast portion of Mississippi, where natural gas has been discovered and is being developed. Indications are that a natural gas supply will be developed for Memphis, Tenn., and Vicksburg, Miss., the latter probably receiving its supply from the Louisiana gas fields while Memphis is hoping to receive its supply from the new fields discovered in the northern part of Mississippi. Coal is the predominating fuel in this group of states.

LOW HEAT REQUIREMENTS PERMIT USE OF SMALL FIXED AND PORTABLE HEATING UNITS

As might be expected when taking into account the climatic conditions, considerable supplementary gas heating is done in the south, using radiant-type surface heaters and other types of gas stoves and gas-fired radiators. Especially is this true in some of the larger cities like Birmingham, Atlanta, Mobile and Nashville but, as a general thing, the send-out for domestic heating is relatively small, and, with few exceptions, local gas companies are not endeavoring to secure this class of business.

Florida is supplied with manufactured gas in the more important resorts. Due to large tourist business and recent land developments, great advance has been made in this state. In many instances the heating business was thrust upon the gas companies and, during the recent boom times, they were taxed to their utmost to meet increasing demands for gas and for extensions into the new sub-divisions. The unusual character of the heating load, which is, in a great many respects, similar to that in California makes the unit system of heating the predominating type. Basements are rare, and central heating systems for residences are uncommon, especially in the region around Palm Beach and Miami. In Jacksonville and other cities in northern Florida gas heating is flourishing and some gas-fired central heating systems are installed, in addition to many unit systems. The central plants mostly are hot water and steam. Oil supplies heat for a large percentage of the commercial buildings. Some electric heating is done, although not to such an extent as in California, and wood is a common fuel.

(*To be continued*)

The Menace of Dust

WHILE our summer death rate has decreased steadily and consistently for the last fifty years, our winter death rate is not showing the same decrease. Prior to 1895 the winter death rate was lower than the summer rate. Since that time, the winter rate has been steadily higher—the difference grows every year.

Taking vital statistics of the city of Chicago for the last ten-year period, we find the winter death rate exceeding the summer rate to an alarming degree. Based on these statistics, there are at least 1500 needless winter deaths every year in Chicago.

How can we explain the failure of our winter death rate to keep pace with the steadily lowering yearly death rate? Our present knowledge points to one outstanding factor as the largest contributed cause—smoke—dust and contaminated air.

The extent of the pollution of our city air is not fully understood by the average layman. Data recently compiled by Howard C. Murphy, of Louisville, from tests extending over a number of years with the Hill dust counter give some figures regarding the actual amount of dirt present in the air of various cities, which upsets some of our preconceived notions.

The following figures indicate the average approximate number of dust particles per cubic foot in different cities, measured with the Hill dust counter:

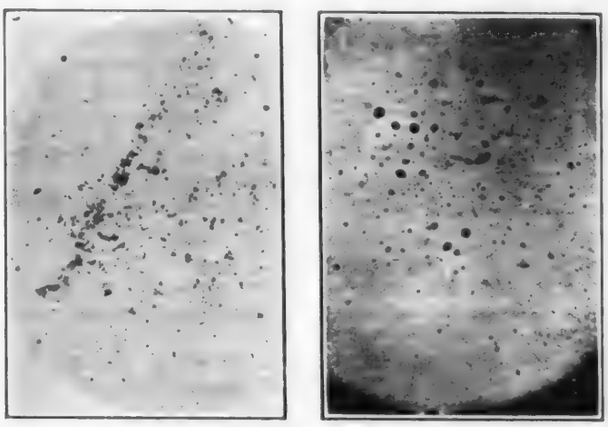
	Average Number of Dust Particles Per Cubic Foot
1. St. Louis	17,600
2. Cincinnati	16,770
3. Pittsburgh	16,100
4. Detroit	15,300
5. Chicago	14,300
6. Indianapolis	14,060
7. Cleveland	13,840
8. Louisville	13,340
9. Buffalo	12,350
10. Baltimore	11,980
11. Milwaukee	11,460
12. Toledo	10,700
13. Columbus	10,160
14. Philadelphia	9,880
15. New York City	9,700
16. Kansas City	9,700
17. Atlanta	9,460
18. Minneapolis	8,470
19. Des Moines	8,370
20. Washington	7,800
21. Denver	6,740
22. New Orleans	6,600
23. San Francisco	6,580
24. Boston	5,360

Note: The Research Committee of the A. S. H. & V. E., through Samuel R. Lewis, has arranged to co-operate with Dr. C. F. Marvin, chief of the U. S. Weather Bureau, in dust tests in the cities of Atlanta, Boston, Chicago, Cincinnati, Denver, Lincoln, Neb., New York, Madison, Wis., St. Louis, Salt Lake City, and Washington.

Mr. Lewis and the committee are further arranging for the collection of data as to the incidence of respiratory infections and the mortality from the same cause to discover if there is any relation or connection between these figures, as seems very probable from the preliminary investigations made.

Transferring these figures into everyday measurements, the average resident of St. Louis is inhaling in excess of a tablespoonful of soot and dirt every 24 hours. The New Yorker and Philadelphian are taking only half as much.

The relation of these figures to the spread of disease is direct and can readily be demonstrated. The number of dust particles and disease germs in the air has been studied by competent investigators. Taking 10 liters of air as a basis, in the Boston



These Microphotographs Show Relative Number of Dust Particles in the Atmospheres of (left) Boston and (right) St. Louis

City Hospital, nearly 450 living bacteria and 225 mold spores were counted in a five-minute exposure of standard agar plates. In a model New York hospital, where every precaution for cleanliness was taken, 12 active germs settled on the plates and after agitating the air, over 226. In a typical New York apartment house, a five-minute exposure showed 75 before, and 2700 after sweeping.

In industry the havoc caused by dust while perhaps less deadly and somewhat less easily visualized is still a tremendous and often unnecessary drain on our resources.

Dust-borne infections, however, represent only one angle of the dust menace. World-wide research has established the fact that our lives literally are dependent on the chemical and actinic rays of the sun. The much-sought vitamins we now know are simply condensed sunshine.

Dr. E. Vernon Hill says: "Here then is a new conception of great importance. Shutting out the ultra-violet rays of the sun by our smoke-polluted atmosphere is in all probability costing thousands upon thousands of human lives each year, and *smoke abatement*, as it has been practiced in the past, gives no promise of a solution of this serious problem, as the reduction in black smoke without a corresponding reduction in the total solids in the air does not materially reduce the haze and fog so common during the winter season, which are as efficient as smoke in diverting the ultra-violet rays. Smoke elimination is clearly the only satisfactory solution."

The Heating & Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

MEMBER

National Publishers' Association
Associated Business Papers, Inc.
Audit Bureau of Circulations
National Trade Extension Bureau
American Oil Burner Association

VOL. 25 July, 1928 No. 7

Published Monthly at New York, N. Y., by the
HEATING AND VENTILATING MAGAZINE COMPANY

Executive and Editorial Offices, 386 Fourth Ave., New York.

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Subscription	$2.00 per year
Canada	2.50 per year
Foreign Countries	3.00 per year
Back Numbers	50 cents each

IN urging heating contractors to prepare themselves for the new marketing era which is opening to them, the Heating and Piping Contractors National Association, through its board of directors, stresses the point that:

"There is a choice of parts we, as contractors, may play in this program. We may scoff at and unduly criticize some immaterial detail of the methods used to bring the buyer to our market .... or we may counsel with the manufacturers in the development of their program to attract the buyer to our industry, and assume our whole responsibility that comes with the opportunity of being the contact between that buyer and our entire industry."

While the whole movement comes under the general head of "merchandising," there is a sharp distinction to be drawn between this term as ordinarily understood and what is coming to be known as "doorbell pulling." In one case, the emphasis is laid on the advantages of dressing up the store or shop, displaying the goods in an attractive manner and carrying on many of the functions of a merchant. In the other case, the activities consist primarily in making house-to-house calls for the purpose of interesting the owners in new heating systems of "radiator heat." Presumably, this activity will have the effect of injecting a spirit of progressiveness into the mind of the contractor, which will be reflected in his methods of doing business and in the appearance of his quarters. Maintaining a showy display room, however, is not an essential part of the movement. We draw this distinction because if, in many cases, the plea to heating contractors to make ornate display rooms of their places of business does not meet with that ready response that its advocates expect, that is no reason why contractors as a body should not embrace the opportunity enthusiastically of extending their activities in the replacement field.

THERE is another feature of the new marketing plan which may be expected to have a salutary effect in eliminating from the industry that large class of "back-alley" contractors who do such a small volume of business, and at such ruinous prices that they are literally a dead weight to the industry. On the authority of the Plumbing and Heating Industries Bureau, we have it that no less than 40% of the shops listed as plumbing and heating contractors have no economic justification for their existence. This statement is confirmed by an investigation conducted by THE HEATING AND VENTILATING MAGAZINE, which disclosed that in a number of typical cities, chosen at random, less than 16% of the local contracting firms handled 80% of the business. In other words, if there are 35,000 "plumbing and heating contractors" in the United States, it is safe to say that the bulk of the business goes to less than 6000.

It is reasonable to expect that an aggressive and sustained campaign for replacement work on the part of the more responsible firms will have the effect of taking the ground from under the feet of the fly-by-night shops and thus remove an element which has long had a disturbing influence in the industry.

IF the manufacturers of heating equipment generally are to go in for the replacement campaigns through the establishment of "stores" from which to operate, what is to prevent such agencies from taking on other supplementary equipment, such as oil burners and gas-heating apparatus? As is well known, the dealer problem is one of the most pressing before the oil-burner industry. Last month we told the story of an oil merchant who has developed a successful oil-burner business in which he assumes all the prime functions of a heating contractor, save only the actual work of installing the heating plant and its oil burner. He recommends and installs not one but several types and makes of oil burners, working out plans for each installation to the best interests of the customer.

New Marketing Era Dawns for the Heating Contractor

First Place at National Convention Given to Manufacturers' Plans for Selling Replacement Jobs. Certified Heating and Standardization Feature Year's Work.

Walter Klie

Mr. Klie is president of the Smith & Oby Co., Cleveland, O. He is a past president of the National Building Trades Employers Association. He also has served the Heating and Piping Contractors National Association successively as a member of the board of directors, vice-president, and chairman of the board of directors. His unquestioned executive ability and fine appreciation of the problems confronting the industry have brought him to the presidential chair.

NEW marketing methods on the part of manufacturers of heating equipment, the certified heating movement and standardization held the center of the stage at the 39th annual convention of the Heating and Piping Contractors National Association, in Philadelphia, June 4-7. The fact that one of the leading manufacturers recently had embarked on a replacement merchandising campaign which was variously interpreted by heating contractors lent an air of expectancy to the convention, which was evident at every session.

Walter Klie, who was to become the next president of the association, speaking as chairman of the board of directors, brought the subject before the convention in an address which was widely commented upon as a masterpiece of diplomatic handling. Mr. Klie pointed out that the replacement market was here and had hardly been scratched. He said that if the heating contractor is not ready and willing to step in and take advantage of his opportunities in this connection, it was certain the manufacturers would find other outlets for their products.

Mr. Klie urged the contractors to prepare themselves for the new merchandising era that is just dawning and to maintain their present status as the channel for the distribution and installation of heating apparatus. He urged the manufacturer and wholesaler to be patient with the heating contractors and to give them time to adapt themselves to the new methods of merchandising and not create new and direct outlets for their products.

One of the resolutions adopted on the final day of the convention was to the effect that:

"Whereas, certain manufacturers of heating equipment are advertising the installation of much equipment at a specified price per room, and

"Whereas, the cost of such installation varies materially in different sections of the country, due to the variation in freight rates, labor conditions, etc., and

"Whereas, this practice is disapproved of by many of our local associations, as an interference in the conduct of their business;

"Therefore, be it resolved, that this form of advertising be abandoned until a conference is had between the companies pursuing such advertising and the directors of the Heating and Piping Contractors National Association, or such committee as said board may select for that purpose."

Certified heating still remains to be "sold" to the entire body of heating contractors, but the reception accorded its presentation at this convention was much more enthusiastic than marked the convention a year ago, and reports from cities where certified heating has had a fair tryout demonstrate that, as a national movement, it is assured and will be successful.

Another encouraging element is the obvious desire of this association and of allied groups to work co-operatively, each carrying on that program for which it is best equipped and fitted, freely passing on data obtained, frequently at no small expense and expenditure of effort, to the end that activities throughout the heating field be strengthened and standardized. In particular the work of the Standardization Committee, headed by Ralph S. Franklin, shows what can be done in this line. The committee really has drawn upon the results of research by the A.S.H. & V.E. and has accepted this organization's standards as its own, and, in turn, it has developed a simple and apparently generally satisfactory method of radiation determination that it hopes to have adopted as "the" standard in the field.

President Harry M. Hart, serving his second consecutive year as president of the association, opened the convention with a modestly-phrased statement that the past year has been the most progressive year in the history of the organization.

Reports of committee chairmen sub-

stantiated this claim and demonstrated that the association rapidly is forging ahead in unity of motive, in setting up standards of increasing value and in formulating plans for the betterment of individual members throughout the country.

Outstanding was the evidence that the impelling motive was a desire to look to the best interests of the ultimate consumer—the man who pays the bill. Not only Harry M. Hart, the retiring president, and Walter Klie, the new incumbent, stressed this point, but it was evident throughout the three days' convention that Mr. Home-Owner is destined to receive more than a square deal at the hands of member heating contractors. While it is admitted that the certified heating campaign will stimulate business and is a productive movement, it also is obvious that its consummation primarily will benefit the home-owner through the assurance of the highest grade of installation.

An indication of the keen interest taken in the association's convention was the arrival, by special train of 176 members, ladies, and guests from Chicago. This was the largest single delegation at the convention from any one city.

Opening Session, June 5

The largest gathering that ever has marked the opening of an annual meeting initiated the thirty-ninth convention held in the ballroom of the Bellevue-Stratford Hotel, Philadelphia, Tuesday morning, June 5, according to the time-honored custom, by singing the national anthem.

President Hart, concluding his second year as chief executive, briefly outlined the salient features of the association's activities during the last twelve months.

"This has been," he said, "the most progressive year that this association ever has known. Last year we announced a national campaign for certified heating. This year we can point with great pride to the rapid growth of certified heating and we have laid the foundation for a nation-wide campaign for home modernizing.

"It does not seem that the high tide of building can continue. We have a wealth of equipment in machinery and personnel that has been employed in new building work, and this vast machine must be continued in action. A huge market can be developed in rehabilitation and replacement. In many cities those with foresight are viewing this situation intently. In a certain city in Illinois, with a population of about 50,000, a leading banker saw the possibilities and secured the co-operation of a group of manufacturers. Following a campaign for the replacement of obsolete equipment and the rehabilitation of defective plants, there was developed a business that surpassed the new building program by a considerable margin. Six or seven cities now have plans under way for similar projects, and I look for the rapid spread of this line of activity in our industry.

New Officers and Directors

President, Walter Klie, Smith & Oby Co., Cleveland, O.; vice-president, Frank W. Howard, Ingalls & Kendricken, Inc., Boston; treasurer, Horace W. Jones, Howe & Bassett Co., Inc., Rochester, N. Y.; secretary, Henry B. Gombers, national headquarters, N. Y. Directors, James S. McVey, The McVey Co., Pittsburgh; Ray L. Spitzley, R. L. Spitzley Heating Co., Detroit, Mich.; William M. Anderson, Philadelphia; Walter Klie, Frank W. Howard, Horace W. Jones, Harry M. Hart, L. H. Prentice Co., Chicago; John S. Jung, Milwaukee, and Robert D. Williams, Baker, Smith & Co., Inc., New York.

"It is gratifying to report that the association now has the largest membership in its history and with the fruition of the activities of our new field representative, I anticipate that our rate of growth rapidly will increase.

"The heating contractors on the West Coast have been particularly active during the past year and Mr. Byrd's trip to the coast has been of decided advantage, both to those heating contractors and to our association.

"This has been a year of co-operation with allied organizations. Many valuable data have been furnished our committees by the Research Laboratory of the American Society of Heating and Ventilating Engineers. We must continue this co-operation with organizations whose activities lie in or around our field of activity, for such co-operation tends materially to strengthen our entire industrial fabric."

President Hart then presented Alexander Murdock, director of public works of the city of Philadelphia, who explained that he represented Mayor H. A. Mackey, who then was in Europe. The address of welcome by Mr. Murdock was one of the shortest on record and although it brought a hearty laugh from the assemblage because of its brevity, there was no doubt of the sincerity and heartiness of the welcome.

Three abortive attempts to set off the flashlight for the convention photograph caused considerable amusement and while the operator departed for some new wiring, the program was continued with an outline of the Spring labor survey, presented by Secretary Gombers. The report reveals that, in 176 cities reporting, the low wage rate is 60c and the average rate $1.226. In the past four surveys, the low rate has risen from 47c to 60c and the average rate has risen from $1.2042 to $1.226.

President Hart then named the following committees: For the nominating committee: J. E. Rutzler, G. P. Nachmann, J. E. Strong, Arthur F. Bowers and G. M. Getschow; for the committee on resolutions: S. A. Jellett, Frank A. Merrill and H. R. Stein; for the auditing committee: William H. Curtin, Harry Geiser and L. G. Kirk.

ADDRESS BY RUSSELL G. CREVISTON

Speaking as manager of the Plumbing and Heating Industries Bureau, Russell G. Creviston declared that the closest and heartiest co-operation between all parts of the heating industry would be necessary in order that the manufacturers, engineers, distributors, retailers and workmen get their share of the vast expenditures now being made by the American public.

"Our people today," he said, "are marked by a great restlessness. It is difficult for them to determine what they want. There are so many things to want." Mr. Creviston declared that the basic reasons for the spirit of optimism now prevalent are that the tremendous wealth of the country has never been so well controlled and that business is highly and well-organized to meet the developments. Due credit was given to trade associations as having been largely responsible for this latter condition.

"A great deal of real market research is necessary," said Mr. Creviston. "Today it is essential that manufacturers know why people buy. The market must be well determined before manufacturing is considered." Mr. Creviston then told an interesting story to illustrate this point.

"The decision of the American college student," he said, "that hats were unnecessary, cast a great gloom in the ranks of hat manufacturers. Suddenly, and almost in synchronism with this calamity, came the discovery that thousands of Chinamen were cutting off their cues and starting to wear American hats. The new trade replaced that of the college boy and the manufacturers are happy." Mr. Creviston told of the organization and plans of the Home Modernizing Bureau and outlined his ideas on the importance of vocational training in the industry.

HEATING AND PLUMBING WORK TO BE SEGREGATED

One of the most significant announcements made at the convention was the statement of Mr. Creviston that the Plumbing and Heating Industries Bureau foresaw, and intended to hasten, the separation of heating from plumbing work.

"It is not our intention," said Mr. Creviston, "to tell the heating contractor that he cannot do plumbing, or to tell the plumbing contractor that he cannot do heating. However, there is no question but that these two branches of industry would be better off if they were segregated so far as might be possible."

Mr. Creviston told of the aims of the bureau in standardizing and simplifying products. He said that the bureau offered professional copy for group advertising and that it also would be available for the discussion of credit problems. He added that the demands made upon the bureau by the heating industry had increased so rapidly that, at the earliest moment, a heating department would be added to the bureau's activities in order that heating contractors might

be served to the best possible advantage.

President Hart then called upon Walter Klie, as chairman of the board of directors, for his report.

HEATING CONTRACTORS URGED TO ADOPT MODERN MERCHANDISING METHODS

Mr. Klie made an earnest plea that the heating contractor study merchandising and make of himself a better business getter. Mr. Klie said:

"The responsibility of this association to its members, while large in many phases, is tremendous where it relates to merchandising. Never has so large a percentage of our population had so much money to spend. Today, there is a much greater manufacturing capacity than there is buying capacity, largely due to tremendous plant expansion during the war. Inter-industry competition is keen and the heating contractor thoroughly needs development as a merchandiser. He is not now equipped to merchandise heating equipment as competitive equipment in other fields is mechandised. It is up to us to adapt ourselves to this newer merchandising as quickly as possible."

"The manufacturers of equipment and material sold and installed by heating and piping contractors, have a full realization of this condition and have taken definite steps to vigorously enter this inter-industry field, as is evidenced by the advertisements and policies of the Plumbing and Heating Industries Bureau, and of individual companies. They are determined to attract a larger part of the buyers' dollar to the things they make and we sell and install.

"There is a choice of parts we, as contractors, may play in this program. We may scoff at and unduly criticize some immaterial detail of the methods used to bring the buyer to our market, because it has not always been done just that way, and when he is ready to buy from us, we may spend all our energy fighting each other over him, so that when the transaction is completed, he has not received either the material or the service which would make him happy with having spent money in our industry, and there has been no profit to us.

"Or we may select another part to play. We may counsel constructively, with open mind and broad vision, with the manufacturers in the development of their program to attract the buyer to our industry, and assume our full responsibility that comes with the opportunity of being the contact between that buyer and our entire industry.

"We may vigorously follow the prospects created for us and assist in creating additional ones; make our places of business and our methods attractive to the potential buyers. See that our selfishness is enlightened and that our recommendations and suggestions are sound, and based more upon what is good for the buyer and the entire industry, than upon what may give us a temporary advantage in the particular deal at hand.

"Talk and sell the better things, based upon a real knowledge of our business, and then so install them that they will attract more business to ourselves and our fellow contractor, and away from other industries. This is not idealistic, but only good business sense.

"The manufacturer and material man also has a choice of parts to play. He may be attracted by short cuts to the buyer. He may be misled by poor or lazy salesmen who are not capable of presenting the merits of their product to regularly established and responsible contractors, and who consequently create new outlets by creating or encouraging contractors with no financial responsibility or professional knowledge, and obligate them to remain customers by the extension of such unwarranted credit that the better contractors are undermined by competition that does not have to pay its bills.

"Or, the manufacturers and material men may co-operate with the right type of contractors, so that they can afford to have attractive places of business and develop sales promotion to tie in with the great national movements for greater business.

"Our industry is different than many others, such as that of the automobile, radio, musical instruments, etc., because so much of the success of the products depends upon proper installation.

"Any campaign for more radiator heat, for instance, would receive a terrible setback, if after a small house builder had been persuaded to pay more money for radiator heat he found that, through faulty installation or quantities, the purchasers of his houses complained about the noises of water hammer, or the lack of proper circulation, or inadequate heat, and caused him more annoyance than might have come from the installation of other forms of heating.

"It is with a full realization of the important part that the contractor plays in our industry that all worthwhile elements are committed to the wisdom of our present channels."

NOTED ECONOMIST POINTS WAY TO CONTINUED PROSPERITY

The high spot of this first meeting was the address of John C. Howell, vice-president, Associated Consultant Economists, who spoke on the business outlook and how it will affect the heating industry. Mr. Howell painted the picture of America's emergence from the war with a large part of all the gold in the world, with tremendously developed factories and with production keyed up to the highest point.

"One of the most important results of the war," said Mr. Howell, "was the breakdown of provincialism. Before the war, America had no use for foreigners, and the half-hearted attempts of American firms to develop foreign business were pitiable. During the next 25 years, one of the most important elements of our industrial business will be the development of international markets. With today's equipment, we can produce, in eight months, our year's supply. Foreign gold has been the backbone of our prosperity during the last ten years and our wealth and credit are now sufficient for any reasonable and necessary building program. There is no sounder basis for prosperity than satisfied labor. There has been a tremendous advance in research and this has been, and will continue to be, a big factor in our industrial development. We must bring about better conditions in our installment selling and we must look to the tremendous potentiality of the farmer as a purchaser of our equipment.

John J. Vogelpohl, past president of the National Association of Master Plumbers, and John Quinn, chairman of the apprentice committee, National Association of Master Plumbers, brought the greetings of their organization to the convention, and were warmly welcomed.

Representing the American Institute of Architects and the Philadelphia Building Congress, D. Knickerbacker Boyd made a brief speech of welcome. Mr. Boyd pointed out the effort being made by the Philadelphia Building Congress to induce home-owners to have necessary repairs on their heating plants carried out during the next two months, and said that a concerted effort to develop this business would go a long way towards filling up the early-summer business valley.

Secretary Gombers briefly outlined his report, as it appeared in the official bulletin. Horace W. Jones made a report as treasurer and, in presenting salient figures, showed that the present net assets of the association are almost $40,000.

The report of the auditing committee was read by Secretary Gombers, following which the meeting was declared adjourned until the following day.

Wednesday, June 6

V. L. Sheldon, chairman, committee on text books, reporting on the present status of apprentice training, stated that, at the present time, there are 3375 steamfitter learners in the United States, of whom 739 are in schools. There are nearly 30,000 journeymen steamfitters, 501 of whom are in schools. Schools offering instruction in heating number 25. The greatest need, according to Mr. Sheldon, is for trained instructors, and the industry is beginning to realize the necessity for developing foremen who, in addition to having the necessary knowledge of craftsmanship, have the ability and training to supervise men. He strongly urged the local organizations to promote a definite training program, preferably in co-operation with state boards of vocational education, and offered to assist local secretaries or committees so far as it might be possible. The committee also appealed to the national association to reconsider the report made at the West Baden meeting last year.

REPORT OF MEMBERSHIP COMMITTEE

Chairman E. W. Verity of the membership committee reported that the enrollment of the association numbers 952.

He said that the membership committee, composed of a general chairman and eight zone chairmen, is carrying on a consistent campaign for increased membership, which is materially being assisted by the field secretary, Edward G. Byrd, during his travels. It is anticipated that the membership will pass the 1000 mark in a short space of time.

F. W. Herendeen, secretary of the Boiler Manufacturers' Association, spoke a few words of welcome on behalf of his organization, emphasizing the cordial relations that now exist between the two organizations.

Leigh Whitelaw, vice-president of the American Gas Association, brought a welcome from his group, interested in the use of gas as a fuel.

"The gas industry," said Mr. Whitelaw, "sells only 2% of all the heat used in American homes. Only recently it has awakened to the possibilities of this field and it can be seen that the volume of potential business is tremendous."

Stewart A. Jellett, Philadelphia, chairman of the committee on uniform mechanics lien law, reported that the committee, selected by Secretary Herbert Hoover, of the United States Department of Commerce, has given a great deal of time to a study of the lien law with the intent to formulate a standardized law. Mr. Jellett stated that the second tentative draft, which this committee has sent out for final review and criticism, was not entirely satisfactory, due to the many factors and industries involved, and said that he doubted if an entirely satisfactory lien law ever could be formulated. Mr. Jellett outlined some of the problems faced by the committee and told of effort to reach a common ground of understanding.

REPORT OF COMMITTEE ON STANDARDIZATION

Ralph S. Franklin, chairman, committee on standardization, said that his committee was dominated by the idea that there could be only one standard in any particular industry, and that this must be *the* standard acceptable to all allied groups. Mr. Franklin gave unstinted praise to the American Society of Heating and Ventilating Engineers for the hearty co-operation of that body by virtue of which the data on steam pipe sizes, largely secured in the A.S.H. & V.E. Research Laboratory, have been made available to the H. & P.C.N.A. for incorporation as its standard, or perhaps as "the standard."

In calling attention to the rapidly increasing use of the H. & P.C.N.A. standard method for determining radiation, Mr. Franklin told an interesting story of the development of this idea to its present state of near perfection. He offered a schedule sheet, developed in his office, on which the heating contractor might enter the essential details and results of computation when making any determination of radiation for a given enclosure. Filing these sheets would enable the contractor or engineer, at any time, easily to refer to computation made years before. To demonstrate how simple the use of this chart is, Mr. Franklin distributed copies to those in attendance, together with the floor plan of a portion of a house. He then proceeded to enter the data and compute the results, showing that but a few moments time is required to determine correct radiator sizes for each room.

This committee has carried on a great deal of useful work during the year, including the preparation of standard tables for several cities, in the development of coefficients of transmission for walls, ceilings and roofs of types not previously considered, and has now taken up the determination of hot water pipe sizes for both gravity and forced circulation.

Mr. Franklin also spoke of radiator tests now being made in co-operation with the American Society of Heating and Ventilating Engineers and with different engineering colleges, the plans being to make elaborate tests on the effect of radiator shields and enclosures to complete this series. Working with the Industrial Unit Heater Association, the committee is formulating rules for testing unit heaters. It was apparent from Mr. Franklin's report that his committee not only has been extremely active during the past year but that its ac-

Opening Meeting of the Heating and Piping Contractors National

complishments are material and outstanding.

R. M. Conner, director of the research laboratory, American Gas Association, told how gas-fired boilers are tested and of the rigid requirements imposed on this class of equipment.

"Any boiler to pass our test," said Mr. Conner, "must show a thermal efficiency of at least 75%. Furthermore, we insist that each manufacturer place a permanent name plate on his boiler on which the outlet capacity of the boiler in B.T.U. is stamped." Mr. Conner stated that recommendation has been made to establish selection factors similar to those used by the Chicago Master Steamfitters Association so that heating contractors could make more intelligent selection to meet any particular requirements. Mr. Conner told of the enormous number of gas-heating boilers and furnaces in use on the Pacific Coast and said that in Los Angeles alone these units are being installed at the rate of 250 per month.

BOILER OUTPUT COMMITTEE REPORTS WORK NEARLY COMPLETED

George M. Getschow stated that, while the sub-committee on boiler output had only a progress report to make, it anticipated having a complete report within 30 days.

CERTIFIED HEATING MAKING GREAT STRIDES

Certified heating is steadily and positively acquiring momentum, according to Herbert A. Snow, chairman of the committee on certified heating, and the conscientious efforts of heating contractors to develop certified heating in any given community entirely nullifies the necessity for local regulation through heating ordinances. This method, he stated, is a far more desirable one than having municipal authorities force the issue with ill-considered ordinances. The second annual advertising campaign is now in preparation, to be ready for use in the coming fall and winter months. Mr. Snow said that, in studying advertising campaigns, there had been brought into the discussion the necessity for introducing into the program ways and means for bringing replacement work under the guidance of certified heating. The methods for securing replacement work are largely untried, but they are being studied and the committee believes that in this practically untouched field there is a wonderful opportunity for the heating contractor as well as for the jobber and manufacturer. The activities of E. G. Byrd, national field representative, already have borne fruit in the certified heating campaign and Mr. Snow predicted a national acceptance of certified heating as a means of raising standards throughout the industry and of developing new business.

A spirited discussion followed this report and it was brought out that, in cities where certified heating had been fairly tried, it proved of inestimable value to the local organization and assured the home-owner of a satisfactory job. It was reported that in Cleveland there had been only four or five cases within the last two years where heating contractors had been called upon to rectify mistakes or errors made in certified jobs, and that the greatest cost involved was less than $100.

In response to a statement that local building methods in some southern localities did not permit the use of radiation calculations from the association's tables, Mr. Snow said that these tables could not be used for special forms of construction, characteristic of different sections of the country until correction factors had been determined.

Discussion centered around the best methods of financing certified heating and Louis Braun, Chicago, reported that the Chicago association added 1% to a contract to cover the services of the local association and that this had been found ample to provide necessary funds. State, county or municipal work is excepted and no charge is made in these instances. Mr. Snow contributed the suggestion that a charge of 1c per sq. ft. of radiation installed also had proved satisfactory. In this connection, it was stated that, in Cleveland, 1c per sq. ft. is charged as a certified heating fee, with a minimum of $5 and with no maximum fee.

An interesting point was brought up by Mr. J. E. McInnis, of Pittsburgh, who stated that the large heating contractor has, in recent years, lost not only much of

Association, Bellevue-Stratford Hotel, Philadelphia, June 5, 1928

his small work, but the great bulk of repair work. He said that the organization with which he was associated had over 4000 repair orders on its books two years ago and only 2800 the following year. In reply to his question as to how certified heating would help large contractors, Harry M. Hart said that certified heating is essentially a promotion of organized business, and that a definite trend toward furnace heating in Chicago had been offset through the careful development of certified heating. The discussion proved this subject to be one of the live issues of the convention.

E. G. BYRD TELLS OF EXPERIENCES IN THE FIELD

Stating that he had visited 20 States and 55 cities during the short time he has occupied the position of national field representative, Edward G. Byrd said that his aim was to organize 20 cities for a certified heating program by January 1. He made the significant statement that in an analysis of 28,000 so-called heating contractors, only 2750 were of such caliber as obviously to be acceptable members in the national association. He told of finding certified heating in satisfactory operation in cities varying from the size of Chicago down to Sheboygan, Wis., with a population of 21,000.

New locals have been established in Chattanooga, Knoxville and Seattle, and he predicted the organization of three more by July 1.

"Local organizations have been so well developed in Wisconsin," said Mr. Byrd, "that it has been found desirable to employ a full-time field man to tie them together." The general impression from this report was that Mr. Byrd had covered a tremendous amount of territory, had made many valuable contacts and that he would become an important factor of value to the national association in organization building, and of no less value to the individual heating contractor by making available to him all of the benefits of association membership.

WELDING FOR THE HEATING CONTRACTOR

One of the most significant papers that has been presented to the industry was on the subject of welding for the heating contractor by J. H. Zink, vice-president and general manager of the Heat & Power Corporation, heating contractors, of Baltimore. Mr. Zink stated that more than 50% of the business of his firm has been on welded jobs, while less than 5% of these contracts has been specified for welding. His paper indicated a careful study of the situation and while he frankly stated that he favored a certain type of welding and certain class of equipment, Mr. Zink pleaded for the adoption of standards in welding for heating contractors and suggested the appointment of a welding committee to determine these standards while the industry yet is young. According to Mr. Zink, the average architect is not informed on the subject of welding and would welcome the advent of standard specifications. Following a brief discussion, the meeting adjourned.

Thursday, June 7

President Hart relinquished his gavel to Louis T. Braun, secretary of the Chicago local association and president of the Secretaries' Conference. Mr. Braun referred to the statement of Mr. Crevis-ton, of the Plumbing and Heating Industries Bureau, that the bureau would establish a separate heating department and strongly urged the desirability of such a move. Mr. Braun outlined what he considered the proper functions of a local secretary in aiding the members to stimulate business and in acting as a medium bringing to local members all the valuable data and developments of the national association. A. Bachman, secretary of the Cincinnati local association, told of activities in Ohio in the training of apprentices and foremen. In the discussion that followed, several secretaries took part and it was evident that this organization has been an important factor in correlating the activities of the national organization.

TEST BUSINESS CAMPAIGN IN PHILADELPHIA SHOWS VALUABLE RETURNS

Telling how the Philadelphia Development League, in co-operation with the Plumbing and Heating Industries Bureau, is expending a budget of $70,000 in a merchandising campaign, E. L. Flentje of the bureau opened the eyes of some of his hearers. Directing a concentrated barrage against home-owners in this city, through direct mail advertising and newspaper space, the sponsors of this movement already have justified more than their wildest claims, for in less than two months' time the actual business return has fully covered the outlay. Contractors, to the number of 142, contributed to this budget and the entire program is being carried out methodically. In order to determine why home-owners buy certain articles and do not buy others, the organization now is making a survey of 1000 home-owners. From returns already in hand, it is evident that the educational standing of the home-owner and his early training and environment are as important factors as his financial condition, in determining his reaction to the advertising of modern heating and plumbing equipment. Mr. Flentje told of one contractor who carried out an aggressive mail advertising campaign, suggesting an inspection of homes and had secured six contracts within two days. Mr. Flentje was enthusiastic over the possibilities of this study and hopes to inaugurate similar campaigns in many important cities in the country.

While the report of Walter Klie, chairman of the board of directors, indicated the attitude of the directors toward direct merchandising by the manufacturer, the report of the resolutions committee contained a special resolution on the subject which is printed in this issue, on Page 87.

ASSOCIATION AGAINST LICENSING

Resolutions also were introduced and accepted placing the association on record as opposed to the licensing of heating contractors or artisans. Following the presentation of conventional resolutions of appreciation and condolence, the convention proceeded to the election of officers. Upon the reading of the slate prepared by the nominating committee, the secretary was directed to cast one ballot as indicating the intent of the members in convention.

The new officers were introduced and welcomed, each responding in a few words of greeting. The convention then adjourned *sine die*.

ENTERTAINMENT FEATURES

Under the direction of Edward F. Roberts, general chairman of the entertainment committee, the Philadelphia association launched a delightful program for the entertainment of visiting members, guests and ladies. On Monday evening the past presidents met at the customary "Old Guard" dinner, after which an informal dance and interesting vaudeville kept the members in the ballroom until well after midnight. On Tuesday afternoon, a commodious river steamer was chartered for a trip down the Delaware to a point beyond the League Island Navy Yard. Several hundred members and guests took advantage of this opportunity to see Philadelphia's waterfront.

Nearly 800 took part in the dinner dance in the evening, the only speaker being Dr. E. J. Cattell who, with wit and pathos intermingled, carried his hearers through the whole gamut of emotions. Wednesday afternoon a long string of interurban busses carried several hundred to Valley Forge and return, following a dinner and vaudeville show at the new Philadelphia Consistory Temple occupied the evening.

On Thursday afternoon, following adjournment, members were guests of the Heating and Ventilating Trade Golf Association at its monthly meeting, at the Manufacturers Country Club. Mrs. Stewart A. Jellett, in charge of the ladies' entertainment committee, proved a most hospitable hostess, and of the many visiting ladies, none lacked entertainment or attention.

Heating and Piping Contractors District of Columbia Association has appointed C. N. Nichols as executive secretary to devote full time to the work of the association in Washington, with headquarters at 710 Fourteenth St., N.W.

Heating and Piping Contractors Milwaukee Association is located in its new offices at 610 Michigan Street. Oscar King is secretary of this local association.

Extensions to Existing Plants Will Feature Next Year's Growth

Projects Already Under Way Indicate a Banner Season Ahead. Central Heating Urged for Housing Operations

FALLING little short of a record enrollment, the 19th annual convention of the National District Heating Association was held at the Ambassador Hotel, Atlantic City, June 12-15, 1928. Registration numbered 94 members and 37 ladies, making a total of 131. Attendance at the session created an impression of a comparatively small group of men engaged in a highly specialized field involving both engineering and financial considerations, and no doubt was entertained as to the solidarity of the organization or the keen interest with which these executives and engineers meet to discuss mutual problems and exchange experiences for common betterment.

The undercurrent of feeling, both of manufacturers and of utility representatives was one of optimism for the very near future. The consensus of opinion is that a very definite growth in existing properties will antedate any great influx of operating companies, and the inference is that the association will lend its best efforts to better both the physical and financial aspects of its member companies before reaching out to stimulate new fields.

One of the high spots of the convention was the enthusiasm and satisfaction caused by the report of Prof. C. H. B. Hotchkiss, of Purdue University, on the outcome of the last district heating school. Professor Hotchkiss made an extremely lucid explanation of the development of the district heating school idea from its inception to the completion of the last course, laying particular stress on the problem from the point of view of the educator. It would appear from the hearty endorsement given the school by the incoming president and other members who attended its session that only a beginning has been made in making available to operating engineers and executives in the industry the best possible technical training.

John W. Meyer

Mr. Meyer is manager of the Steam Heat Sales Division of the Philadelphia Electric Co., Philadelphia, Pa. For three years he served as chairman of the rates and regulations committee of the National District Heating Association, and, since its inception in June, 1926, he has been chairman of the development committee of the association. Mr. Meyer also is a member of the National Electric Light Association, American Electrochemical Society, Illuminating Engineering Society, and the American Economic Association.

Sessions were occupied largely by committee reports, nearly all of which had been printed and distributed prior to the convention and both the reports and the discussions aroused by them proved that committee members had been wisely chosen for their keen interest in the problem to which they were assigned.

The paper prepared by Stephen Delany was exceptional because it frankly discussed the mistakes that had been made and errors that had been corrected in order that a woefully sick water heating system might be built into a paying utility.

A. H. O'Reilly drove all the way from Winnipeg, Manitoba, to absorb from the convention and, in turn, to tell his fellow members how district heating is carried on in Winnipeg. Mr. O'Reilly's paper brought forth a shower of questions, largely in view of the fact that electric boilers, absorbing nearly 5000 H.P. of electrical energy, are used to supply steam to the street mains. What might be called "waste energy"—the output from a tremendous hydro-electric plant 70 miles from Winnipeg—is used during the off-peak period, and when Mr. O'Reilly was

asked for the cost of this energy, his reply elicited smiles and jocular remarks on getting fuel for nothing. Mr. O'Reilly's talk, to him only the recital of commonplace facts, fairly bristled with suggestions to his hearers less fortunately situated in regard to a cheap supply of electrical energy.

John W. Meyer, the incoming president, undoubtedly is one of the strong men in the industry, and his forceful leadership was everywhere evident during the convention. His selection presages a vigorous attack on the problem confronting the industry, following very closely the lines laid down by the retiring president, Charles A. Gillham.

Tuesday, June 12—Afternoon Session

With President Charles A. Gillham presiding, the convention was called to order in the Japanese Room with its comfortable chairs and broad expanse of windows looking out over the Atlantic. Delivering a "utility welcome," C. H. Howell, manager, Atlantic City Electric Company, spoke for his organization and in behalf of Mayor Ruff. After briefly voicing his hope that the delegates would enjoy both the business sessions and the recreational features provided, Mr. Howell, acting for the Mayor, presented President Gillham with an attractive gilt key to the city. He touched on his long and delightful friendship with Secretary Gaskill, who, replying on behalf of President Gillham, told of Mr. Howell's advancements in the industry from the foot of the ladder to the executive management of this outstanding public utility.

President Gillham, in his address, after paying a warm tribute to members of the executive committee and officers for their enthusiastic association activities during his regime, spoke of the growth of district heating in America. He called attention to the fact that the New York Steam Company with about $40,000,000 invested, derived during the past year an operating revenue of approximately $8,000,000, this showing being commensurate with the operations of gas and electric utilities in the metropolis.

Mr. Gillham pointed out that a survey of district heating rates indicates definite upward revision. Improper rates, he said, were more responsible for failure or low earnings than any other factor, and, where property values are high, rates can be above those for other heat producing agents.

Mr. Gillham stated that the New York Steam Corporation has 2300 buildings on its line, a large proportion of which have no boilers. These buildings have a total cubic contents in excess of 1,250,000,000 cu. ft.

About 1500 of these buildings with total cubic contents of over 600,000,000 cu. ft. have no boilers and, in many instances, smoke stacks also have been omitted.

"I have jotted down a few statistics pertaining to the corporation," said Mr. Gillham, "including data on operation for the 12-month period ending March 31, 1928, which I trust will be of interest to you. These are tabulated as follows:

Station capacity, 135,000 H.P.
Heat load at 16° temperature, 112,000 H.P.
Total length of mains and service lines, 250,000 ft., or more than 47 miles.
Number of consumers, 2300.
Cubic contents of buildings served, 1,250,000,000.
Average annual revenue per customer, $3300.
Minimum monthly bill, $20.
Maximum monthly bill, approximately, $15,000.
Coal burned (anthracite, screenings and bituminous), 537,000 gross tons.
Average cost per gross ton, $4.60.
Steam to mains, per pound of coal, 7.50 lbs.
Steam sold per pound of coal, 5.78 lbs.
Fuel cost per 1000 lbs. sold, $0.29.
Total operating expense per 1000 lbs. sold, $0.62.
Average price received, $0.97.
Operating ratio, 64%.

"I have given you these statistics only because I am more familiar with the operation of this company than with any other and I believe that they represent good practice at the present day."

ASSOCIATION IN STRONG POSITION FINANCIALLY AND NUMERICALLY

Presenting a financial report to the association, Secretary Gaskill stated that the balance on hand was nearly $5000 and that, with a gain of 15 new members, the total roll now stood at 315. The dues, he said, were better paid than they had been in the past. Mr. Gaskill reviewed the association's operation with the handbook and with the district heating school at Purdue University. He spoke enthusiastically of the work of the educational committee in contributing to the success of this school in close co-operation with Prof. C. H. B. Hotchkiss, and stated that the enrollment in the two courses just completed was nearly twice as great as for the session last year.

President Gillham then appointed W. W. Stevenson and J. C. Butler to constitute an auditing committee.

EDUCATIONAL COMMITTEE ENTHUSIASTIC OVER DISTRICT HEATING SCHOOL

Secretary Gaskill read the report of the educational committee for Chairman J. H. Walker, who was unable to attend the convention. "The principal work of the committee during the past year," wrote Mr. Walker, "was the work of further organizing the district heating school at Purdue University. Credit should be given to W. A. Perkins, of Aurora, Ill., who was the initiator of this idea. The committee is so thoroughly satisfied with the results attendant upon the two courses just completed that it wants to be able, through the co-operation of Purdue University and Professor Hotchkiss, to repeat the school, possibly with enlarged scope, next year."

Referring to the handbook, the committee recommended that the secretary be authorized to reprint the necessary loose sheets until a new edition has been prepared.

L. S. Smith, chairman of the heat utilization committee, reported that the committee was making progress, particularly in collecting data on three phases of major interest to the association:

(a) The development of a set of approved standard drawings of connections, in order that this practice be made uniform.

(b) Correct operation of customers' equipment.

(c) The study of the operation of the Detroit demand rate.

In reference to the last named problem, Mr. Smith said:

"This is the second season that the demand rate has been tried in Detroit. This rate calls for the payment of $1000 per year per 1000 lbs. of maximum demand, plus 60c per 1000 lbs. of steam consumed, all subject to 5% discount, whereas the regular rate is $1.30 per 1000 lbs. consumed for the first 100 lbs. per month, less 10% discount, plus $1.00 per 1000 lbs. net for the excess. The minimum billing demand was reduced from 5000 to 3000 lbs. per hour at the beginning of the season, which resulted in 31 customers being placed on this rate. It was necessary, however, to put seven of them back on the regular rate as their load factors were found to be too low to benefit by demand billing.

"The dividing line between the two rates is a load factor of about 24%, which is somewhat higher than that for the average office or mercantile building. Hotels, club buildings and hospitals, with load factors between 28% and 43% show savings running from 7% to 19%, while newspaper plants are next with a saving of about 6%." Mr. Smith said the committee has under consideration the study of open-end steam use and that it solicited information on this subject.

ASSOCIATION TO CO-OPERATE WITH A.S.H. & V.E.

A. V. Hutchinson, secretary of the American Society of Heating and Ventilating Engineers, was presented to the convention by President Gillham. Bearing greetings from the society, Mr. Hutchinson invited the members of the association to participate in the coming mid-summer convention at West Baden Springs, Ind. He spoke of the benefits resulting from the close co-operation of the two organizations, particularly in regard to the problem now in hand—the heat requirements for buildings. Upon motion by D. L. Gaskill, the convention voted to have appointed a committee of three to co-operate with the A.S.H. & V.E. on heat requirements.

MANUFACTURERS' REPRESENTATIVES ADDRESS CONVENTION

Opening the manufacturers' round table, Secretary Gaskill outlined this plan of having manufacturers or their

representatives appear before the convention briefly to bring to its attention new equipment devised and brought out during the past year. The first speaker W. Ogden of the Squires Company, Cleveland, described the reducing valve produced by this organization with which pressures up to 500 lbs. can be reduced to 1 oz. in a single step. The valve is designed to nullify the effects of fluctuations on the high-pressure sides and it also can be dead ended.

J. D. Cunningham, of the Republic Flow Meters Company, then described the essential features of the new Republic condensation meter.

He told of the development of suitable bearings that would be so frictionless as to permit the meter to register on very low load and yet be substantial enough to withstand the shocks incident to transportation and installation. Mr. Cunningham forecast the announcement of an instrument from new designs that now is ready to be turned over to his service department for criticism and advice.

President Gillham appointed as the nominating committee, George W. Martin, Henry Meyer and R. D. DeWolf.

The meeting then adjourned.

MEETING OF MANUFACTURERS' DIVISION

Members of the manufacturers' division gathered for a conference postponed from the previous afternoon.

J. W. Meyer read the proposed amendment to the constitution providing for possible association divisions of which this group would constitute one. A. J. Slade, president of the division, told of the work already carried out and a general discussion followed regarding possible lines of activity. John W. Meyer expressed his belief that tremendous developments were possible in utility electric heating so applied as to increase the load factor of the station. The meeting then adjourned to reconvene later during the convention.

Tuesday Night Session

Presenting the report of activities and accomplishments of the manufacturers' division, A. J. Slade stated that the manufacturers had organized two years previous, the prime object being the extension of district heating. Inasmuch as the normal activities of the association as a whole do not tend to develop new business, the function of this division is not antagonistic but is supplementary to the work of the development committee.

John W. Meyer, chairman of the development committee, then outlined the activities of his group and, in discussing the distribution of steam in New York City, stated that a single boiler in the New York Steam Corporation's plant could supply 13 department stores the size of Macy's. Mr. Meyer then read the proposed amendment to the constitution, arousing considerable discussion, both as to the necessity for the change and the desirability of providing for a separate division within the association.

ILLUMINATING TALKS ON DISTRICT HEATING TECHNIQUE AND PRACTICE IN CANADA

A. H. O'Reilly, of the Winnipeg Steam Heating Co., Winnipeg, Canada, then gave many members, who were not familiar with the unique practices in his organization, some new ideas on the possibilities of district heating, particularly where low-cost hydro-electric energy could be obtained. Mr. O'Reilly first presented a series of lantern slides, embracing views in the downtown district of Winnipeg, pictures of the exterior and interior of the electrical stand-by plant—the source of district heating—and numerous diagrams and graphs illustrating operating conditions and cycles. In presenting the tabulation of heat-loss data, Mr. O'Reilly brought out the fact that these have been developed by Prof. A. R. Greig, of the local university.

"Conditions of wind, sunshine and building in Winnipeg," said Mr. O'Reilly, "are favorable to low consumption of heat energy per square foot of radiation, although we provide for an inside temperature of 70° with an outside temperature 30° below zero. In making tests of one building, we found that storm windows reduced the heating requirements by 15% and most of our repsentative buildings are insulated and equipped with storm windows and weather stripping. Mr. O'Reilly's description of the two electric boilers in use in his station precipitated a number of questions and considerable comment. This paper concluded the meeting.

Wednesday, June 13

A human interest story of the struggle to put one of the earliest district heating systems on an earning basis was told by Stephen Delany, superintendent of the hot-water heating department of the Atlantic City Electric Company (see page 76). Considerable discussion ensued and Mr. Delany issued a cordial invitation to the visiting delegates to inspect the power plant and such parts of the distribution system as could be seen.

Following a brief paper on the hot-water system in Terre Haute, Ind., by Henry Meyer, J. C. Butler, chairman of the operating statistics committee, presented his report which, while not surpassing previous reports in the number of companies represented, does so in the completeness of information given. Mr. Butler stated that 75% of the district heating business of the country was represented in this report.

Some of the interesting points brought out are:

"The average annual quantity of steam sold per company per customer varies from 259,000 lbs. to 15,000,000 lbs.

"Some companies own large, modern, central steam stations; others generate steam in small plants located in the basements of buildings, while between these two extremes we find a variety of combinations.

"A few companies purchase all of their steam from another department, while others purchase a portion of their steam and produce the balance.

"The increased generation of electricity and the distribution of exhaust or extracted steam at low or moderate pressures is well indicated in this report.

"We have given a large variety of fuels as to kind, price, and B.T.U. A few companies burn more than one fuel. One company burns oil only, while two companies burn a large quantity of wood refuse. In order to make the report uniform in all respects, the coal tonnage and the price per ton has been put on a short ton basis when otherwise submitted.

"The item giving the greatest difficulty of comparison is that of the number of employees for the office, plant, and miscellaneous labor requirements. Where the heating company is a department in an electrical company, either the office work or the plant operation or both may totally or partially be carried on by the electrical company. Construction work in some companies is done by their own men, while in other companies it is given out under contract."

DISTRICT HEATING SCHOOL AT PURDUE UNIVERSITY

Prof. C. H. B. Hotchkiss, head of the department of heating and ventilating engineering at Purdue University, Lafayette, Ind., told a comprehensive story of the activities of the educational committee, following its decision to inaugurate a district heating school at Purdue and of the consummation of the plans for the school last year and again for a repetition of the school this year when an attendance increase of 100% was secured. Discussing the way in which the first school was organized, Professor Hotchkiss said that the committee had decided the policy and that the university had carried out the ideas of the association in every possible detail. The course, he emphasized, was designed to be basic and not operating, vocational or manual.

At the close of the first school, which had an attendance of 23, Professor Hotchkiss sent a questionnaire to those who had attended, in an effort to determine the value of the course from the standpoint of the student. The replies, he said, were very encouraging, although no tangible results had been anticipated. Instructional work was carried out by Professor Hotchkiss, Prof. J. D. Hoffman and six other members of the faculty. Professor Hotchkiss was particularly appreciative of the fact that in writing to 50 manufacturers for co-operation, through the supply of equipment and data, every one of the 50 entered into the project with enthusiasm.

Voicing his personal opinion, Professor Hotchkiss said:

"I feel that the course was rather crudely presented lasted year, largely due to lack of time for preparation of the subject matter, but that the experience enabled us to make a very satisfactory presentation this year. The use of a large teaching staff was not an unqualified success, due to a slight overlapping of instruction, and I believe that in the future a smaller staff will be

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desirable. The second course, as presented this year, lacks polish and can considerably be improved, as is only natural under the conditions. Of the 62 from whom applications were received, 60 started in the course this year —20 in Course I and 40 in Course II. There was too wide a variation in type and experience of the men; this made it necessary to handle the subject matter over too wide a range and brought up many vexing problems of presentation. I find among those who have attended the school that a definite benefit is derived from taking such a basic course.

PROFESSOR HOTCHKISS OFFERS SUGGESTIONS FOR FUTURE COURSES

"Now, as to my personal recommendation for the future. The division of work between the committee of your association and the university staff, together with the very close co-operation that has existed, has worked out very satisfactorily indeed. Both schools were handicapped by lack of time in preparation and it would be desirable to plan at least a year in advance for any future work of this kind. Many suggestions have been made by members of your committee and by students. Nearly all of these deal with the class of instruction to be given. Some suggestions have been made to change to the vocational type of instruction and suggestions have been made to conduct classes in more than one place, preferably not at an educational institution. Also, it has been suggested that outstanding men in the association should, to a large degree, constitute the instructional force. Another thought that is worth considering is the idea of making attendance at this school a prize to stimulate employees of each organization. Also, some one suggested that companies making a practice of employing young college men should have a definite course of education within their own organization."

John W. Meyer, in expressing his appreciation of the work of Professor Hotchkiss said:

"After watching the work of the first school and having been a student in the second school, I can testify to a very marked improvement in the course. It will be my recommendation that this work be continued and extended. Those with whom I talked who have participated in the second course felt that there was a large field yet untouched that would lead possibly to courses in design, turbine operation and other specialized phases. We owe a large debt of gratitude to Professor Hotchkiss and to the university for the splendid work that has been done without any thought of compensation and I feel that proper acknowledgment should be made."

Upon motion of Mr. Meyer, a rising vote of thanks was tendered to Professor Hotchkiss.

J. C. Butler, for the auditing committee, then reported that the books of the treasurer had been audited and found to be correct.

REPORT OF THE NOMINATING COMMITTEE

The nominating committee presented as its slate the following names: For president, John W. Meyer, first vice-president, J. C. Butler, second vice-president, L. S. Smith, third vice-president, W. W. Stevenson, secretary, D. L. Gaskill, and for the executive committee, Charles A. Gillham, J. H. Walker and A. G. Leach.

On a motion, the secretary was instructed to send a telegram expressing hope for an early recovery to W. K. Abernethy of Chicago, who had been taken ill while enroute to the convention.

The manufacturers' round table was opened by F. A. Guenther, representing the Direct Control Valve Co., Chicago, who described the design, construction and operation of the direct control valve.

A. M. Hammond and Edward Smith, Jr., representing the Builders Iron Foundry, Providence, R. I., discussed the commercial and technical features of the shunt flow meter, and J. C. Hornung described economies secured in typical buildings through the use of the Hornung pressure and thermostatic system of master control. The meeting then adjourned.

Thursday, June 14

J. J. Schenk, chairman of the meters and accessories committee, opened the meeting with a discussion of a study of meter failures as reported by 16 different companies from all parts of the United States, during the period from October 1, 1927, to April 1, 1928.

METER FAILURES REPORTED AND ANALYZED

The total number of meters in use by these companies during this period numbered 9328 divided into three different makes as follows: Detroit and Cadillacs, 8264; Adscos, 255; and Simplex, 809.

The total failures numbered 634, or 6.79%, of which 374, or nearly 60% of the total was due to two causes, which undoubtedly could be remedied by the manufacturers. The first and largest of these was due to bearing trouble from which there were 207 failures, most of which were due to improper lubrication. A more efficient method of lubricating these bearings should greatly reduce this cause of failures. The second of these causes was due to dirt and numbered 167. The dirt in many instances became lodged in the slot of the spout, completely sealing it. If the slot could be made somewhat larger, it would undoubtedly diminish the number of failures and prevent the complete sealing over of the slot. Or if a strainer was attached to the inlet on each meter, it should to a large extent eliminate dirt failures and also increase the accuracy of the meter.

The remaining 260 failures, or about 40% of the total, were due to counters and miscellaneous troubles of various descriptions.

Due to the fact that Detroit and Cadillac meters were classed together in the majority of reports, it therefore was necessary to class them together in the final report. However, from these reports in which they were separated, the bearing failures were approximately equal in both these meters. This is important to note as different methods of lubrication are used.

Included in the report were suggestions on points to be considered in drawing up specifications for condensation meters, such as the accuracy of the meter and the period of time of its maintained accuracy. Also there seems to be a difference of opinion as to the temperature at which the condensate enters the meter. The question was raised as to whether

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or not specifications should not provide for accuracy at a given temperature to cover different meter sizes. For example, meters with capacities from 0 to 1000 lbs. per hour might be based on 180° F. condensate. Condensate temperature for meters from 1000 lbs. and above might be 140° F.

Data were included in the report of a special test to determine to what extent the temperature of the condensate affected the accuracy of scroll type condensation meters. Another test recorded in the report was one to determine the relation of the true demand at the inlet of the system and the demand at the condensation meter.

In one case the peak at the inlet occurred during the first minute at the rate of 83 lbs. per minute, while the outlet peak occurred 14 min. later at the rate of 67.5 lbs. per minute. In another case, where the service valve located before the steam flow indicating meter was partly closed in order to obtain lower pressure the inlet peak occurred one minute after steam was turned on at the rate of 58.6 lbs. per minute and the outlet peak occurred 15 min. later at the rate of 55.5 lbs. per minute.

Two other tests, which gave fairly similar results, showed the inlet peak occurring during the first minute at the rate of 48 lbs. and 45.1 lbs. per minute, with the outlet peak occurring 8 min. later at the rate of 30 lbs. and 33 lbs. per minute. One conclusion reached from the tests was that the difference in time for the peak outlet to be reached is due to the use of radiator traps in the first two cases cited and the absence of radiator traps in the last two cases.

The report included suggested specifications for the acceptance of meter types.

In the discussion that followed J. C. Butler pointed out some of the difficulties occurring on account of bearing trouble, and W. A. Perkins said that, in his experience, this trouble had been minimized by using a suitable lubricant. N. L. Ayers reported that systematic and proper care of meters was a big factor in their accurate and satisfactory operation. Speaking of practice on the Pacific Coast, A. D. Leach said that flow meters had been very successful and that the trouble with condensation meters was largely due to improper lubrication, which was the fault of the operating company and no reflection upon the meter.

REPORT OF RATES AND REGULATIONS COMMITTEE

A voluminous report was submitted by John W. Meyer in the form of an analytical study of existing basic methods of rate formulation. Mr. Meyer described, in turn, the more common types of radiation charge—flat rate, metered rate and demand rate, including the flat demand, the Wright demand, the Hopkinson demand and the Doherty, or three-part rate. He discussed the principles underlying each of these methods of forming equitable rates for both large and small consumers and, in discussing the more modern types of rate structures, he showed graphs illustrating the development and determination of unit base prices and unit base charges, as well as the determination of the base selling curve to meet any specific operating conditions.

In the discussion this paper was characterized as the most comprehensive and illuminating presentation of the rate subject that had yet been made for the benefit of the district heating industry. E. E. Dubry, Detroit, told how the Detroit-rate structure was determined and brought out the difficulties due to the use of univent and vento surfaces, to variations in radiator capacity, and particularly to over- or under-radiation of individual buildings.

John W. Meyer read the proposed amendment to the constitution providing for the organization of various divisions of the association, and after Secretary Gaskill had outlined the reasons for this amendment, it unanimously was adopted.

MANUFACTURERS' ROUND TABLE

Webster Tallmadge told an interesting story of the development of a consulting business looking to the study of unsatisfactory heating plants and their rehabilitation. He said that there was a large, untouched field of this kind that could be made profitable, both to the consulting engineer and to the manufacturers. George Martin, leading the discussion, spoke strongly in favor of the idea and said that it represented a further attempt to give the customer a better service.

A. J. Slade, of the American District Steam Co., referring to the previous discussion on the subject of flow meters, said that his organization was working on low-pressure flow meters that would show but a low error throughout the entire range. He said that all available data indicated that such an achievement was well within the realm of possibility and that he hoped before long to be able to demonstrate these meters.

The meeting then adjourned.

Friday, June 15

The report of the nominating committee appeared to meet with universal approval, and on motion the ticket selected by the committee was declared elected.

Presenting the report of the station operating committee, E. E. Dubry, chairman, discussed feed-water treatment, boiler-water concentrations and wet steam, operating costs, smoke abatement and plant appearance. Under the heading "Laboratory Experiments" were given results of tests made to determine the cause of boiler water foaming in copper boilers and in iron boilers. On the subject of "Smoke," the report included a typical smoke ordinance covering the average boiler plant.

REPORT OF DISTRIBUTION COMMITTEE FEATURES STEAM CONDUIT DRAINAGE

W. W. Stevenson, chairman, reported on the study that has been made by the distribution committee in regard to drainage from steam conduits. Emphasizing the fact that the committee's report is intended to furnish information of value to the members, Mr. Stevenson said:

"Steam conduit drainage will be considered under the following heads:

1. Ground drainage,
2. Sewer and water line leakage,
3. Tide and flood water protection,
4. Steam distribution operation under flood conditions.

"These are not isolated elements of steam distribution; necessarily they overlap.

"No standard form of conduit drain of systems in all communities is readily applicable, due perhaps to the individual community's peculiar requirements, or the general design of the system itself. In most cases, however, there has been provided at least a concrete base laid with substantial clearances between it and the insulation of the steam main. This, in a measure, serves as a reservoir for water which finds its way into the conduit, and, with suitable drain of the base provided, soon finds its way to a drain to the sewer.

"In communities where the sub-surface structures are quite congested, the grade of the base is dependent almost entirely upon the grade of the sub-surface structures, since practically all other structures are laid at substantially the same depth below pavement level. If then a steam main were laid with only the necessary clearances between it and other sub-surface structures, the grade of the conduit base would necessarily follow that of the street surface.

SEWER AND WATER-LINE LEAKAGE

"Among the most difficult problems which arise in the operation of steam mains are the effects of a leaking water main, or a broken or a leaking sewer line. The operating man finds himself practically helpless to proceed, especially where the leakage has already found its way into the conduit and drains are found inadequate to carry off the water. It builds up around the steam main and soon reaches a temperature where ordinary portable pumping facilities are useless. In most cases relief can be furnished only by the sewer or water departments of the Municipal Government, a slow moving body at best, or at least it appears so to the operating man in the midst of this trouble.

"Where the condition is one of continuous existence or of frequent recurrence, a solution can be effected only by substantial constructive measures. The methods employed would then be dependent on economic factors. The work would involve the relaying of either the sewer or water mains or the replacement of the steam main conduit with one of a more improved design. Should the cost of any of these methods appear prohibitive, the protection then could be afforded only by the installation of adequate pumping facilities.

"Where a leakage from water mains or house services is met only occasionally, it is argued at times that the cause of the condition is attributable to the radiation of heat from the steam main conduit. In some instances the argument holds true, especially where the water pipe is of the lead type and has been installed with only scant clearances between it and the steam main conduit. The appearance of the lead pipe in such cases will show a formation of concrete wrinkles or corrugations, resulting in a split, and is due presumably to an expansion and contraction of the lead pipe in a longitudinal direction. Or it may show a bulge in the pipe, with the resultant thinning of its walls, due to the heat having been localized at the point where the fracture occurs.

"It has been found that where a minimum clearance of 2 ft. has been provided between water and steam mains that the cause of fractures due to heat radiation is virtually eliminated.

"Where the steam main is laid above both sewer and water mains, as in Milwaukee, the operating troubles, as reported by H. Warhanek, superintendent of heating of the Milwaukee Electric Railway & Light Company, appear to have almost entirely been eliminated since the adoption of the present design of steam main conduit.

"This design shows a monolithic conduit of concrete key poured joints and provided with a reinforcement to avert settlement of main conduit due to the undermining effect of water leakage. Where the culvert from curb catch basins crosses above the steam conduit, an additional thickness of concrete conduit wall is provided.

"The conduit lines of the New York Steam Corporation distributing systems are generally laid at levels above sewer lines. Where, however, it is necessary to divert from this standard and mains are laid at approximately the same elevations as sewers, the conduit drain is provided with a gate valve which remains closed normally and is used only when water seepage into the conduit is apparent. In the construction of a steam main conduit, both water and sewer lines are encountered at all points. And, since the troubles which might normally arise from these sources are small in number as compared to the length of the entire distributing system, it then would appear that ordinary conduit design is sufficient provision for leakage protection. An absolute preventative against any seepage would involve a cost beyond consideration.

"The installation of gate valves on sewer drains has been the best solution of flooding of the conduit by overflowing sewers, and it has been found economical to install them on older installations which were put in before these valves became a part of the standard construction. Surface leakage into the conduits, even at extreme floods, is negligible, as all manhole heads are provided with solid covers machined to a relatively snug fit.

"Where pump manholes are provided, they must be separated from the steam conduit and preferably at an appreciable distance. Their base should be lower than the drainage base of the main to permit a free flow into the chamber by gravity. Pump manholes must be accessible for entry, no matter what the conditions are and must be ventilated continuously so that in case of submergence of the pump manhole, vapor can freely escape. The manhole should be outdoors rather than in a building basement so that in case of submergence vapor can escape to the atmosphere. A drain pipe not less than 10-in. in diameter should connect from the low point of the steam conduit to the manhole. This should be supplied with a valve and should discharge through an elbow turned down into a sump in the pump manhole in such fashion as to form a seal to prevent vapor following.

"Electrically-driven centrifugal force pumps in multiple (the number depending on the severity of conditions), should be installed. Where high pressure steam is available, a supplementary emergency unit should be provided in the form of steam ejectors or steam pumps. Independent floats must be provided for each unit, and all valves in pump manholes should be operated from the street surface.

STEAM MAIN OPERATION AND DISTRIBUTION UNDER FLOOD CONDITIONS

"Where continuity of service is an absolute requirement, the effects on plant operation during flood conditions may involve horsepower demands in excess of plant capacity. This results in loss of distribution pressures, and interference with service to the consumers on the outlying points of the district. In a certain large plant, generating an appreciable horsepower, the excess horsepower demand due to tidal or flood conditions has been as much as 45% of the normal steam deliveries to the main.

"After flooding has occurred, immediate provision must be made at the low point of the main to insure maximum drainage facilities for the relief of condensate within the steam main itself. Mention has been made that water always will flow to the low point of the conduit. The same principle applies with respect to the condensate within the main. Any relief afforded by drainage at the low point will substantially avert the possibility of a water hammer rupturing the pipe or fittings. It has been observed that where steam flows even at highest velocities, condensate will not be carried with the steam, but will flow back to the low point of the main.

"Within economic reasons thus far, no satisfactory equipment can hastily be provided which absolutely will deal with a main under submergence from flood or tidal conditions. Every operator is faced with not only the problem of the moment, the actual submergence, but the ever-present possibility of greater and more disastrous difficulties arising in the form of accidents. These might occur from manhole covers being blown from the street castings, endangering street traffic or pedestrians; the possible entry of steam into abutting buildings, with resultant damage; and the effects

New Officers

President, John W. Meyer; first vice-president, J. C. Butler; second vice-president, L. S. Smith; third vice-president, W. W. Stevenson; secretary, D. L. Gaskill. For the executive committee: Charles A. Gillham, J. H. Walker and A. G. Leach.

on other sub-surface structures, especially electrical conduits.

"With these things in mind during the emergency, the operator can only do his utmost toward keeping his pumping and drainage facilities working at their maximum capacity. In the last analysis the final solution to operating steam mains under flood conditions always must be a matter of design.

Following a general but brief discussion, President Gillham called John W. Meyer, his successor, to the chair. Mr. Meyer voiced his appreciation and his desire to carry on the very much worthwhile work that has occupied the association during the past year. The other newly-elected and reelected officers responded in turn and the convention then was declared adjourned.

ENTERTAINMENT

The entertainment committee, H. C. Kimbrough, chairman, and Stephen Delany, of the Atlantic City Electric Company, as local executive, made the convention period one of pleasure to both men and women visitors. On Tuesday evening the ladies were given a theater party and on Wednesday they were luncheon guests at the Seaview Golf Club, following which bridge, croquet and outdoor games occupied the afternoon. Wednesday evening was left open in order that visitors might make their own selection of the many Atlantic City offerings.

The climax of the entertainment program was reached on Thursday evening, when the annual banquet was held in the Venetian Room of the Ambassador Hotel. Contrary to usual practice, no set speeches were made, nor was there a speakers' table.

Secretary Gaskill presented the past-president's emblem, in the form of a gold badge, to the retiring president, Charles A. Gillham. This, and the distribution of the golf and other prizes, concluded the dinner.

On Friday afternoon the ladies, as well as the non-golfers among the men, were taken for a bus ride around Atlantic City and through the Northfield Country Club, where tea was served and interesting diversions occupied the afternoon.

New Officers of Manufacturers' Division

New officers of the Manufacturers' Division, elected at a meeting, June 14, at the Hotel Ambassador, following the adoption of a constitutional amendment by the National District Heating Association, giving the division official status, are:

President, R. C. Gottwald, Ric-wiL Co., Cleveland, O.; vice-president, W. K. Abernethy, Central Station Steam Co., Chicago; secretary-treasurer, H. W. Coombs, E. B. Badger Sons Co., Boston; executive committee, J. C. Hornung, Chicago, F. N. Speller, National Tube Co., Pittsburgh, Pa., and A. S. Armagnac, THE HEATING AND VENTILATING MAGAZINE Co., New York.

Plumbing and Heating Industries Bureau

Chicago to Be Headquarters of Bureau

In or before January, 1929, the headquarters of the Plumbing and Heating Industries' Bureau will be moved to Chicago. This decision was reached at a meeting of the board of directors of the bureau, held in Memphis, Tenn., June 22, during the annual convention of the National Association of Master Plumbers.

Regional Conference on Training Programs for the Plumbing and Heating Industries

A definite regional program of apprenticeship and apprentice training, journeyman training and foreman training, was initiated and launched at a regional meeting recently held in Denver, Col. This meeting, which was attended by more than twenty representatives of the major interests, heating contractors, and master plumbers, journeymen plumbers and steam fitters and school people from the eleven western states, was conducted under the auspices of the Federal Board for Vocational Education, the National Association of Master Plumbers, the United Association of Journeymen Plumbers and Steam Fitters, the Western Industrial Education Association, and the Plumbing and Heating Industries Bureau.

Plans and standards were formulated and adopted for the guidance of state and local interests in the inauguration of state and local training programs in these eleven states.

Bureau Increases Personnel

Three new department heads, comprising a director of publicity and editor of the Monthly Service Bulletin, an office manager and an advertising manager, have been appointed by the Plumbing and Heating Industries Bureau, Evansville, Ind.

As director of publicity, Norman J. Radder will prepare a weekly article for newspapers and magazines on some interesting feature in the heating and plumbing industry. Mr. Radder also will be editor of the Monthly Service Bulletin and will present new and expanding activities of the various departments of the bureau. For the last eight years Mr. Radder was associate professor of journalism at Indiana University, and also has written two texbooks on journalism.

F. C. Park is the new office manager, with 20 years' experience in accounting, systematizing, and office management. Formerly he was office manager for the Sheet Metal Trade Extension Committee, also having had charge of the expenditure of the million and a half dollars for the nation-wide advertising and promotion program for recovering lost markets and finding new uses for sheet steel.

Hugh L. Wood, as the new advertising manager, will direct the national advertising campaign and will bring to the thousands of retailers the full benefit of his experience. He is in charge of the *Saturday Evening Post* advertising campaign and local newspaper advertisments, window displays, etc. Mr. Wood has completed two new advertising books. The Ad Book for Master Plumbers contains 50 advertisements covering every piece of plumbing equipment sold. The Ad Book for Heating Contractors contains 52 advertisements. Mr. Wood formerly was advertising and sales-promotion manager for the John T. Milliken Company, pharmaceutical manufacturers, where he conducted a trade paper and direct mail campaign that brought to the company the world trophy awarded by the Direct Mail Advertising Association, for a mail advertising campaign featuring specialty products.

West Coast Offices Established

A western district of the Plumbing and Heating Industries Bureau now is in operation, with two branch headquarters' managers in charge, and one to be appointed. Manufacturers, wholesalers and retailers, and also the bureau, have pledged $23,000 for the operating budget of the west coast organization for the year. Many individual heating contractors and master plumbers have pledged annual financial support.

Establishment of these three western branch headquarters will give the western trade all benefits of bureau membership. John C. Keene, acting manager of the San Francisco office, has been appointed to carry on the work of the bureau in that section. John Denning, for years in association work in Texas, will be in charge of the southern California district, with headquarters in Los Angeles. A manager for the Washington and Oregon territory will be appointed.

In order that each state or district may retain control over matters of policy relating to its territory, committees have been appointed to handle all questions of a state or district nature.

At the various organization meetings it was agreed that the major activities for the coast branch of the bureau will be the Used Home Rehabilitation Campaign, contact with women's organizations, and sanitation legislation.

American Society of Heating and Ventilating Engineers

Manufacturers' Interests Prevent Adoption of Boiler Code

Expanded Program of Co-operative Research with Colleges Announced at Summer Meeting. Value of Nicholls Heat-Flow Meter Demonstrated by Data Obtained.

AFTER many months of effort on the part of the committee on rating low-pressure heating boilers, resulting in the compilation of a code which was offered for adoption as the most feasible method of initiating standard practice in boiler rating, the American Society of Heating and Ventilating Engineers, at its semi-annual meeting, in West Baden Springs, Indiana, June 26-29, turned down its committee and voted against the adoption of its code.

In the vote a sharp line of demarcation was drawn between those supporting the manufacturers' position and the engineering element in the society, the vote being nearly two to one against adoption. On motion of Dean Anderson, who had championed the manufacturers' position in the discussion preceding the vote, the report was referred back to the committee "for further consideration." As one of the society's oldest members remarked, after adjournment of the session: "This leaves the matter exactly where it was prior to the founding of the society. The society, as you know, was organized specifically to settle the then existing dispute between the manufacturing interests and the heating contractors on this very same subject."

Outstanding on the program was the report of research carried out under the direction of F. C. Houghten, with the Nicholls heat-flow meter. The time and money spent in the development of this instrument, and the faith in its value were more than demonstrated in the presentation of graphs that vividly showed the flow of heat through roofs. Positive lobes gave quantitative flow inward, when the sun beat down upon the roof, and smaller negative lobes indicated the outward flow when the space under the roof was warmer than the atmosphere above the roof, and the heat flowed outward. Some crude experiments to determine the effect of wetting down tile roofs undoubtedly will be expanded, as the derived curves clearly showed the cooling of the tile under the evaporating water.

Only a short time has elapsed since the approval, by the council, of the plan of Sam Lewis for extending the research program to include co-operative work with leading technical schools, yet there are now six of the most important of these universities well along on specialized research, and there is an excellent probability that as many more will thus be engaged within the year. The research committee wisely has decided to have each school specialize in one of the distinct phases that it desires to have investigated, thus each group will develop into unquestioned leadership and authority in its assigned subject.

The importance of infiltration on heat losses was stressed in the last session, when three technical papers bearing on this subject were presented. For the first time domestic oil-burning was the subject of a paper, and the importance of gas as a domestic fuel was attested by two papers on different phases.

Approval, by the council, of the institution of a chapter with headquarters at Indianapolis, to be known as the Indiana Chapter, marked an epoch in the activities of a group of members well known for their interest in the affairs of the national organization, and the announcement was greeted with hearty applause.

A total registration of 242 indicated a larger attendance than at the White Sulphur Springs meeting last June.

Tuesday Afternoon, June 26

Following a luncheon for the officers of the society and authors of papers, the 34th semi-annual meeting was opened in the ballroom of the West Baden Springs Hotel, with President Willard presiding. In a few well-chosen words Professor Willard expressed his pleasure that the society should come to Indiana at this time, in view of the fact that this section had become so well represented in the society that a petition had been presented to the council asking for a chapter charter for Indianapolis.

Representing the Hoosier State, Prof. J. D. Hoffman, of Purdue, past-president of the society, voiced the welcome of the state to the visitors. President Willard read a letter from O. P. Hood, chief mechanical engineer, U. S. Bureau of Mines, expressing his regret at not being able to attend the meeting, and highly praising the society for its technical activities.

Development of Gas Heating for Homes

The first paper was a brief but comprehensive résumé of the essential phases of domestic gas-heating. W. E. Stark told of the early days of gas heating, using both manufactured and natural gas. He presented graphs showing the annual production of natural gas for the last nine years, and the average consumption per domestic consumer; also a chart showing the variation in the cost of gas for domestic heating purposes during the same period. Admittedly the charts did not permit the derivation of data showing the gas used specifically for the heating of homes, but the tremendous increase in the general use of gas was clearly indicated. Speaking of the factors that control the present and future situation, Mr. Stark said:

"The problem that is uppermost in the minds of the gas companies that are contemplating embarking in the heating business seems to be that of load factor. Heating is a very seasonal load to be sure. Without going into the very large number of items that must be considered in determing whether a given class of load is desirable for a gas company to have on its lines; such as fixed charges on the producing and distribution system, diversity and demand, it might be

interesting to point out that every industry that is related to heating works under the same seasonal handicap. The seasonal character of the heating load is felt and imposes its relatively low load factor on coal miners, mine owners, railroads and coal dealers. That load factor which is merely a scarecrow waiting to be stripped of its rags, is demonstrated forcibly by the fact that the last American Gas Association rate list shows 208 communities in the United States in which special heating rates are granted by the companies supplying manufactured gas. This list shows gas rates for a total of 1019 communities. In 20.2% of them gas is sold for heating purposes at a rate lower than the usual domestic rate.

"The effect of domestic heating on a gas company's domestic load is demonstrated by a brief analysis. Assume that a community has 10,000 domestic meters and that the average annual gas consumed per meter is 40,000 cu. ft. of 535 B.T.U. gas. Among these 10,000 domestic consumers there will be a certain number of what might be termed average prospects for residence heating, living in residences having a heating demand of about 350 sq. ft. of direct steam radiation. In a latitude where the annual heating season amounts to 6000 degree-days, the 535 B.T.U. gas consumed to supply 350 sq. ft. of direct steam radiation during the normal heating season will amount to about 385,000 cu. ft. In other words, one heating installation will have an annual demand equivalent to 9.6 average domestic consumers. If 100 domestic consumers, representing 1% of the total, can be persuaded to heat their homes with gas, the company's annual domestic distribution will be increased by 9.6%. Residence heating by 2% of the domestic consumers will increase the annual domestic consumption 19.2%. Residence heating by a little over 10% of the domestic consumers will double the annual domestic sales. This analysis demonstrates in a crude way why gas can be sold for heating purposes at a lower rate than it can be sold for other domestic uses.

Great Future Ahead for Gas Heating

"Gas as a heating fuel has its best days ahead of it. The surface has merely been scratched. It has been predicted that some day it will be looked upon as a crime to burn coal in the raw state. Distributing and burning coal as is done at present entails a three-fold waste. A very large fraction of the coal that is mined is used in transporting the remaining fraction. The greater part of the coal that is usefully applied is consumed in domestic heating plants where there are two avenues of waste. The domestic heating plant is extremely inefficient, discharging value up the chimney in the form of unconsumed carbon and valuable by-products that might be obtained by gasification. The unconsumed carbon, in the form of soot, with its accompaniment of sulphur dioxide, unites with water vapor and forms sulphuric acid, destructive to steel, limestone and vegetation. The pall of smoke hides the sun and intercepts the health-giving ultra-violet rays.

"The extensive acceptance of gas as a building-heating medium waits on the following elements:

a. Economic pressure due to rising cost of heating fuels that are now cheap in first cost but that cannot efficiently be utilized.

b. Development of cheaper gasification processes and public utility commission and municipal approval of the marketing of the gas resulting therefrom.

c. Development of uses for by-products of gasification.

d. Increasing demand for unpolluted atmosphere."

Discussion of this paper was headed by F. D. Mensing and Perry West. Their questions were answered by C. George Segeler, technologist of the American Gas Association, who discussed the pros and cons of so-called conversion jobs, where gas burners are installed in boilers designed for use with coal. "These," said Mr. Segeler, "are not comparable in efficiency with real gas-fired boilers. In the first place the non-luminous gas flame does not emit a large proportion of radiant heat, and it is this form of heat that the coal-fired boiler, with its comparatively large direct surface, is not designed to absorb to the best advantage. Again, the gas flues of the boiler designed for coal are short and large, and the gases from the gas combustion shoot through them with too little scrubbing action to permit the absorption of a large amount of the contained heat."

Professor Hoffman, E. B. Langenberg and R. V. Frost joined in the discussion which centered around the effect on chimney mortar, of the large amount of water produced by the combustion of gas. Harry Hart told of the many chimneys that had to be rebuilt in Chicago following the use of natural gas in "the old days" when this fuel was piped into Chicago from Indiana. It was brought out that this gas had a comparatively high sulphur content, and that its combustion, and the resulting formation of water, produced sulphuric acid which was responsible for the crumbling of the mortar.

In the absence of both A. E. Stacey, Jr. and W. B. Thornton, the next paper was presented in brief by L. L. Lewis.

Method of Calculating Cost of Gas Heating

The authors of this paper have developed a simple method for the approximate determination of excess air in flue gases of gas-fired boilers and furnaces. They have then developed graphs indicating the relationship between efficiency, flue-gas temperatures and excess air and have devised charts to show the relationship between the degree-days of a heating season and the gas consumption for different types of systems. The foregoing leads to a method for the determination of yearly gas consumption based on the excess air contents of the flue gases and on the efficiency chart. The authors say in part:

"From a study of the chemical analysis of different gases, it was found that the amount of moisture in gases resulting from combustion varied with the percentage of excess air introduced into the combustion chamber. This relationship presents an easy method to determine the amount of heat loss in flue gases."

Opening the discussion, Willis H. Carrier brought out a number of points commonly overlooked in connection with the consideration of gas-fired heating plant efficiency. He pointed out, among other items, that the air drawn up the chimney through the draft breaker commonly installed with gas-fired boilers, represented a definite thermal loss for which the heating plant was charged, but that this action represented a distinct contribution to the ventilation of the home, and therefore, should be put in the credit column. Discussion then centered around the best heat value of gas used for heating. It was brought out that this value was largely a matter of regulation by the controlling public utility commission, and that, as a highly controversial and technical matter, it had best be allowed to rest.

In the absence of Nelson Thompson, Perry West was asked to present the essence of his paper.

Operating Data on Federal Buildings

As chief mechanical and electrical engineer, office of Supervising Architect, U. S. Treasury Department, Washington, Mr. Thompson has an unusual opportunity for securing and analyzing data relating to the 1400 buildings under control of the Treasury Department. In this paper, he summarized a tremendous mass of tabulated and similar data, presenting empirical figures that should, because of the vast territory covered, and unquestioned accuracy of the figures themselves, represent fair average practice.

Of the buildings considered, about 100 are marine hospitals, quarantine stations, mints and assay offices, and in the aggregate 2000 boilers are installed, of which all but ninety generate steam at low pressure. In segregating the cost of repairs, the total of which for the last fiscal year was $550,000, it was found that the repairs to heating and ventilating apparatus totaled $250,171. Taking the estimated value of all mechanical equipment in these buildings as approximately $50,000,000, it was found that the cost of repairs is approximately 1% on this amount. The reproduction cost of all the buildings is estimated as half a billion dollars, so that the mechanical equipment represents almost exactly 10% of their value.

COST OF OPERATING FEDERAL BUILDINGS

In an analysis showing aggregate operating supplies of something over

$2,400,000, Mr. Thompson segregates the fuel used as follows:

136,871 tons bituminous coal	$730,010
23,100 barrels fuel oil	32,802
Central station steam, 294,625 M lbs.	256,876
Natural gas 97,777,000 cu. ft.	34,000

From which it would appear that the percentage of total expenditure was, for each of these fuels in the Federal buildings (the tabulation not including mints, assay offices, marine hospitals and quarantine stations), as follows:

Coal	69%
Oil	3.1%
Central station steam	24.7%
Natural gas	3.2%

The report indicates that steam is purchased for 51 buildings scattered throughout the country and is purchased at an average cost of 87c per 1000 lbs.

After a brief discussion by L. A. Harding and A. G. Sutcliffe, in which both agreed as to the value, to the heating engineer, of the data presented by Mr. Thompson, the meeting was adjourned.

Wednesday, June 27

Reporting for the nominating committee, E. K. Campbell called attention to the fact that an endeavor had been made to have each chapter represented in the slate. This had been done as far as possible and the report contained the suggestion that the practice be established. As there are now more chapters than nominations to be made, with the probability of a further increase, it was suggested that a rotating plan might offer the best solution.

NOMINEES FOR 1929

For president, Thornton Lewis.

For first vice-president, L. A. Harding, Buffalo, N. Y.

For second vice-president, W. H. Carrier, Newark, N. J.

For treasurer, W. E. Gillham, Kansas City, Mo.

For members of the council, E. B. Langenberg, St. Louis, Mo., G. L. Larson, Madison, Wis., J. F. McIntosh, Pittsburgh, and W. A. Rowe, Detroit.

Upon motion the report was unanimously accepted.

J. C. Miles read a paper on

Heating Industrial Buildings With Warm Air

This paper consists of an analysis of the heat requirements of a large garage in Cleveland, with description of the forced draft warm-air system installed therein, and to a statement of fuel required and economies effected in maintaining required temperature conditions.

The building substantially is a single room with curved truss roof 23 ft. high at the mid point. The contents of the building is 375,000 cu. ft. Calculations for the building indicated that in zero weather to maintain 40° temperature inside, 754,300 B.T.U. per hour would be required.

A horizontal cast-iron furnace rated at 850,000 B.T.U. per hour was installed with a fan in the warm-air circuit of the centrifugal, squirrel-cage type, having a rated capacity of 13,000 cu. ft. of air per minute.

An overhead system of heat distribution delivers air to ten outlets, which are directed at an angle of approximately 45° so that the outlet velocity, calculated at 1000 ft. per minute, might deliver the air at the floor.

From bills for coal burned in this garage, it was found that 18 tons of run-of-mine Pocahontas, and a small amount of Pittsburgh bituminous coal were burned; 10% was added for wood, and it was found that the overall efficiency, based on the calculated heat loss, was 87%.

The average breathing line temperature was found to be 52.7° F. and the average temperature at the outside wall 50° F.

E. K. Campbell, opening the discussion, said that there had been a change in the attitude of the society toward warm-air heating, as evidenced by the papers on this subject included in the present program. He objected to some of the conclusions and figures presented by Mr. Miles, and said that the example cited was an extreme case of a system depending upon high air velocity, the air change being at the rate of two per hour, while the garage code committee will recommend three changes per hour as a minimum. Mr. Campbell said that warm-air systems, growing in popularity in the Middle West, had, on test, shown high fuel economy. F. A. Kitchen, Jr., said that in his practice he had found the heat in the cooling systems of automobiles, brought into a garage for day storage, to be a contributing factor to the heat requirements of the garage, and that a determination of the extent to which this might be true would form the basis of tests during the next heating season. He told of contemplated tests in co-operation with Washington University, to fix the diffusion of exhaust gases in garages, with relation to health, using fan blast, direct radiation and warm-air heating.

V. S. Day, formerly professor at the University of Illinois, now with the newly organized Carrier-Lyle Corporation, read his paper on:

Relative Consumption of Various Solid Fuels in Residence Heating

This paper developed comparisons of the relative economy of six distinct classes of solid fuels, and outlined a method of approximating the consumption of any other solid fuel of known physical and chemical characteristics. The data were obtained in the research residence of the National Warm-Air Heating Association, at the University of Illinois, and will appear in a bulletin soon to be issued by the University Experiment Station.

"The data presented in this paper," said E. K. Campbell, "are of particular value to the furnace manufacturer. Of more value than some of the points brought out, is the fact that this furnace was of a type not designed for hard coal." E. S. Hallett testified to the value of the figures presented, particularly in his own territory, St. Louis, where the price-differential was radically different from that existing in Urbana. Percy Nicholls read a prepared discussion in which he said that this sort of test was greatly needed to establish the difference between efficiencies obtained in the laboratory and in the field. Exhaustive tests, using a wide variety of coals, had been made by the Bureau of Mines, and the report soon would be published. E. B. Langenberg said that, closely allied with the problem presented by Mr. Day, was the problem of instructing operatives in the best way to fire boilers. He stated that the activities of the smoke abatement committee in St. Louis, had decreased the smoke nuisance at least 40% during the past year.

T. H. Smoot, Petroleum Heat & Power Company, read the paper prepared by W. C. McTarnahan on the subject of:

Design and Performance of Domestic Oil Burners

The purpose of this paper obviously was to present to the heating engineers and to those interested in the application of oil to domestic heating, a semi-technical analysis of the various types of burners available at the present time. Mr. McTarnahan made an exhaustive analysis of oil burners listed by the Underwriters', cataloging them first as (a) vaporizing burners, and (b) as mechanical atomizing burners. The first classification then was divided into natural draft vaporizing burners and mechanical draft vaporizing burners. The advantages and disadvantages of these types were set forth with technical accuracy and fairness.

Turning to the more highly developed and popular burners that atomize oil in preparation for the vaporizing stage, Mr. McTarnahan listed them in these classes: (a) Atomization under pressure through an orifice. (b) Atomization of mixture of air and oil through an orifice. (c) Atomization with high-pressure air. (d-1) Atomization from a vertical rotary cup or disc. (d-2) Atomization from a horizontal rotary cup. (d-2-1) Horizontal rotary-cup burner with air turbine-driven cup and (d-2-2) Horizontal rotary-cup burners with direct-driven cups.

Under each of these heads Mr. McTarnahan discussed the fundamental principles of design in construction and combustion and listed the advantages and disadvantages inherent in each. In concluding Mr. McTarnahan said: "Mechanically these burners have been developed to such an extent that as operating units they are quite reliable but this is not the only measure of successful performance. For this reason too much stress cannot be laid upon the importance of installing oil-burning equipment with the care that is necessary for its proper operation. It is dependent for

proper operation upon the correct installation of the various control and safety mechanisms. The boiler must be capable of utilizing the heat of combustion to a degree that is commensurate with the economy of operation expected, and the heating system must correctly be proportioned to assure uniformly satisfactory results.

"In the matter of applying oil burners in existing heating systems it is a well recognized fact that many of the boilers used for domestic heating purposes leave much to be desired in the matter of design for efficient application of oil fuel. There is a definite need for an intensive study of this problem.

"While the problem of the individual oil-burner manufacturer in his research and development work is essentially to improve the performance of his own unit, the industry as a whole, working through the American Oil Burner Association, is contemplating a research program that will embrace not only a study of the fundamentals of oil combustion but also a study of the design of boilers and furnaces so that the efficient utilization of the fuel will be assured."

Homer Linn expressed his appreciation for this paper as a well-rounded presentation of the present-day situation. H. M. Hart voiced the opinion that the greatest weakness of the oil-burner industry had been its failure to tie up to the heating industry, and that burners had not yet been developed that would be universally satisfactory in all heating plants as they now exist. E. B. Langenberg pointed out that the greatest difficulties in his part of the world had come from the installation of burners in old, leaky furnaces. Failure on the part of agents who had made too low a price, to overhaul the furnace and see that it was tight, has caused much dissatisfaction. Franklin Hardinge, Chicago, told of his experiences during the 12 years he has been developing an oil burner. He was emphatic in declaring that the oil-burner industry has made a bad start in attempting to sell burners as merchandise and said that the only satisfactory solution would be reached when the oil burner was taken up by the heating industry, and oil burners were marketed through the recognized and legitimate channels of the trade.

IMPORTANT TECHNICAL PAPERS ARE PRODUCTS OF LABORATORY RESEARCH

As an introduction to the series of papers dealing with activities at the Research Laboratory, President Willard called upon S. R. Lewis to outline the present status of the research program. Mr. Lewis briefly sketched the problems that were being handled in co-operation with technical universities and told of similar activities to be initiated. He told of the arrangements made with the University of Minnesota, University of Wisconsin, Purdue University, Carnegie Institute of Technology, University of Kentucky, and the Texas A. & M. College, and said that working arrangements practically had been consummated with Washington University, St. Louis, University of Michigan and Pennsylvania State College. He spoke of the fine co-operation that had been secured from the U. S. Bureau of Mines and the Weather Bureau, as well as with the Heating and Piping Contractors National Association and the National District Heating Association.

F. C. Houghten, director of the Research Laboratory, presented a joint paper with C. G. F. Zobel, of the laboratory.

HEAT TRANSFER THROUGH ROOFS UNDER SUMMER CONDITIONS

This paper* represents the gathering, compilation, study and analysis of a great many data secured with the Nicholls heat-flow meter applied to three different types of roofs in Pittsburgh. An interesting study was made of the flow of heat through a tile roof that had been well sprinkled with water, the characteristic heat-flow meter curves showing a very marked decrease in the flow of heat into the building and a marked change in the time at which heat began to flow out of the building in the afternoon or evening. Other tests were made to determine the effect of color and character of the surface on heat absorption, radiation and flow by covering the sections of the roof over two meters with black and white oilcloth. Commenting on the significance of these tests, Mr. Houghten said:

"An inspection of the data presented impresses one with the fact that heat flow through a roof in summer is by no means a simple or continuous phenomenon. Almost without exception there are two complete reversals of flow in each 24-hr. period. The resultant flow in either direction, over a period of several days, is never large and may be in either direction—that is, to say, the heat flow into the building through the roof during the day is about equal to the heat flow out during the night. The maximum rate of heat flow inward during the day is much higher than the maximum rate of flow outward at night, but heat flows out over a greater part of the 24-hr. period.

"The short duration of flow inward is striking and varies somewhat with the heat capacity and thermal resistance of the roof. For the concrete tile roof the average period of inward flow was 10 hrs., while the maximum and minimum lengths of this period were 12 and 6 hrs. For the slag-surfaced and cinder-fill roofs the average maximum and minimum lengths of the inflow period were 10 hrs. and 15 hrs.; 12 hrs. and 20 hrs.; and 5 hrs. and 7 hrs., respectively.

"It also will be observed that in the case of the heavier and better insulated cinder-fill roof, there is a greater lag between the temperature impulse or temperature difference causing flow and the resulting flow. The maximum rate of flow occurs later than the maximum temperature difference which causes the flow. For the concrete tile, the slag-surfaced and the cinder-fill roofs, respectively, the average lag of maximum heat flow behind maximum temperature differences are 2 hrs., 3 hrs., and 8 hrs. during the day, and 4 hrs., 5 hrs., and 9 hrs. during the night."

The author followed through a comprehensive computation of heat-flow coefficients and presented several tabulations, showing coefficients tabulated from results of this study for concrete tile roofs, slag-surfaced roofs and cinder-fill roofs.

C. G. F. Zobel, research physicist at the Research Laboratory, presented the next paper, which had jointly been prepared with Director Houghten.

COEFFICIENTS OF HEAT TRANSFER AS MEASURED UNDER NATURAL WEATHER CONDITIONS

Incorporating heat-transfer coefficients found during the past year through the use of the Nicholls heat-flow meter, this paper* offers abundant justification for the long period of development of the meter and indicates its value and accuracy in accomplishing something hitherto impossible.

Discussing the results obtained, Mr. Zobel said:

"The variation in coefficients presented herewith is due to several variables including rate of change in mean temperature and actual mean temperature of the wall tested.

"When the temperature of the wall is changing, all of the heat that passes through the meter does not pass completely through the wall. When the temperture of the wall is rising while heat is flowing outward, some of the heat measured by the meter is required to raise the temperature of the wall. Hence, some only enters the surface, while the remainder passes into the wall to greater depths. Only a portion of the total quantity of heat entering the meter leaves the cold side. It is obvious therefore that the outside surface coefficients should show considerable variation with changing temperature, whereas the conductivity or conductance coefficient calculated from the heat measured also must be in error to a lesser degree.

"It is well known that most materials show an increased conductivity with a higher mean temperature of the material, hence heat transmission coefficients determined under varying temperature conditions must show a variation due to this cause.

"In order to observe any relation between rate of change in the mean temperature of the wall and conductance, all bi-hourly determinations in one test were plotted against the rate of change in mean wall temperature.

"The rate of change in mean temperature was determined by dividing the total change in temperature between two

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consecutive bi-hourly readings by the time elapsing and applying this rate of change to the time half-way between the two. When the temperature of the wall was rising, the rate of change was indicated as positive and, while falling, as negative. Although the individual points show great variation there is an unmistakable tendency to form a well-defined curve. The variations of the individual readings from this curve as drawn is much less pronounced than the variation in the magnitude of the individual determinations of the conductance coefficient."

Commenting on this paper, L. A. Harding declared that this was the first paper of the kind that had ever been submitted to any engineering body in the world, and that the society should express its appreciation to the laboratory. J. F. Reed, New York, told of application of water to roofs in tropical countries, where it was the custom to supply water at just about the rate of evaporation, so that the roof was nearly dry. He also told of the use of aluminum paint, applied to storage tanks and of similar applications to reduce heat absorption. L. L. Lewis mentioned some of the points that particularly interested the air-conditioning engineer, particularly corrections to heat-flow coefficients on account of color of roofs. He brought out that a study of the effect of temperature of water used to cool roofs would be of no small value to those engaged in refrigerating engineering and air conditioning.

Thursday, June 28

Opening the next session, President Willard read a telegram from W. H. Driscoll, expressing his regrets at being unable to attend the meeting; also a message of greeting from Prof. E. O. Eastwood, secretary of the Pacific Northwest chapter. Prof. F. B. Rowley read an extract of the paper prepared jointly by himself, F. M. Morris and A. B. Algren.

Heat Transmission Research

The studies forming the basis of this paper were made in the Engineering Experiment Station in the University of Minnesota as a portion of the cooperative research program between the society and the university. The object was to refine test methods, to make a more exhaustive series of tests covering both built-up wall sections and insulating materials, and to determine accurately the relation between the results obtained by different test methods. The high points of this report as presented by Professor Rowley are:

"There are at least three well-known methods for determining heat transfer through materials—the hot-plate method, the hot-box method and the Nicholls heat meter. Thus far this work has been confined to work with the hot plate and the hot box.

"The fundamental difference between the constants derived by the two methods is that for those derived by the hot-box method and the Nicholls heat meter, the so-called surface resistances of the materials are included; whereas in the hot-plate constants they are eliminated, the first two being better adapted for determining the heat transmission through built-up wall sections and the hot plate for determining the conductivity of homogeneous materials. With a proper knowledge of surface constants for a material, it should be possible to calculate the transmission from air to air from the conductivity of the material or the hot-plate constant. Likewise the hot-plate constant should easily be determined by the other methods provided the surface temperatures can correctly be taken. Formulae for the conversion from one constant to the others have been developed and are well known, but in practice the application of these formulae do not always give comparable results. This disagreement seems to be due to the lack of knowledge of proper surface constants to be used in connection with the hot-plate conductivities. Many variables enter into the problem and only by a careful control of these variables when the constants are derived can the results be applied with any degree of certainty.

"With these general problems in view, a series of tests has been outlined with the following objectives:

a. To determine practical heat transmission constants for the different wall sections in common use.

b. To determine the surface constants of materials under different conditions of surfaces, air temperature, air motion and width of air space.

c. To work out the proper relation between the hot-box and hot-plate results, such that one may be derived from the other.

"The series of walls to be tested includes frame construction, brick, tile and concrete, both with and without insulation, the aim being to cover typical walls of each type.

"Thus far tests have been conducted on more than twenty of those walls in common use, and also many tests have been made on the common types of insulating materials.

"In so far as possible average commercial materials were selected, but as is well known many of these materials vary in thickness, density and conductivity. Due to this variation and also to the fact that two different walls built up after the same specification will not have identical thermal properties, small differences in the coefficient of transmission U cannot be taken as conclusive in comparing different materials unless such differences are obtained by more than one set of tests.

"By a comparison of the results obtained by duplicate tests on the same wall section, it is evident that the apparatus and test methods are reliable and that results are easily duplicated on the same test section. If, however, two different walls are built up after the same specification there is a variation due to materials. As an example, two walls were built at different times but from materials of similar specifications. When tested wall 7A gave a constant U = 0.212 while wall 8 gave a constant U = 0.222. From an examination of the walls the only apparent difference between the two walls was in the thickness and sap in the sheathing. In another case in which white pine was substituted for fir sheathing a still greater reduction was noted. On the other hand, the two walls Nos. 11 and 30 were built up of the same stock of insulating board used both as a plaster base on the inside and as sheathing on the outside. These walls tested 0.152 and 0.155 respectively.

"If materials can be exactly duplicated then the test results may be duplicated, but in many cases this will be impossible. With many of the quilted materials, there is a spread or increase in thickness when it is flanged between the studding. This increase is not uniform and may make a wide variation in the constant obtained. For this reason definite comparisons of the value of different insulating materials should not be made from the tests on one wall of each kind. Many of the wall constructions have been duplicated and are in the process of testing; others will be duplicated and reported with new types of construction at a later date.

EFFECT OF MOISTURE IN WALLS

"With those walls which contained more wet material in their construction a longer period was necessary for drying out before testing. For instance with wall No. 17, this was dried four weeks and then tested, giving a transmission constant U of 0.123. It was then allowed to dry for four weeks longer when a test gave U = 0.115. It is possible that if dried for another month it might have given a still lower constant. Likewise wall No. 18 after drying for six weeks gave a constant of 0.125. This same wall after drying ten weeks longer gave a constant of 0.110. This shows the necessity of thoroughly drying the walls before test."

Thornton Lewis praised this paper as a commendable move to bring about harmony in basic coefficients, and said that the day was not far off when the completion of this research would leave an unassailable foundation for heat transmission calculations. F. C. Houghten suggested that the figures obtained on tile walls, differing materially from figures published in the *Guide*, were at variance on account of differences in the tile rather than because of error of observation or method of determination. He told of wide variations found in testing concrete walls, due to the ageing

characteristic, and said that the same conditions probably would be found to obtain in testing tile walls. It was suggested that variations in plaster thickness and composition would bring about the necessity for a variable coefficient. A discussion followed regarding details of construction of the hot-box, and the means used to prevent error due to radiation from the electric heating element used, and Professor Rowley explained that the wire was heated to only a low temperature, and that provision was made to prevent the slight radiant emission from causing error.

C. G. Segeler, American Gas Association, reported that an analysis of more than 200 homes, made on the basis of computations based on coefficients, taken from the *Guide*, showed that heat losses were as follows:

From	Per Cent
Walls	27
Roofs	16
Glass	26
Doors	5
Infiltration	26

He suggested that, through the use of weatherstripping and by tightening windows, the greatest saving could be brought about with minimum expenditure.

F. W. Herendeen, secretary, The National Boiler & Radiator Manufacturers Association, was presented, and expressed the greetings of his organization. Dean Anderson was called to the front and, amid applause, seated beside the chairman.

Report of Boiler-Rating Code Committee

In the absence of Chairman Alfred Kellogg, S. R. Lewis outlined the activities of the committee on rating low-pressure heating boilers since the meeting at White Sulphur Springs. He said that the committee had met on an average of once a month, and had held a three-day session at Pittsburgh, in which 16 representatives of boiler manufacturers had joined. It was felt, by the committee, that the code now embraces all of the reasonable suggestions that had been made, and the committee was unanimous in standing behind it. He explained that the code covers all data to be derived from three tests, and that, when the sub-committees on chimneys and on boiler selection complete their work, the situation would be well in hand for a fair try-out. Mr. Lewis then, on behalf of the committee, moved the adoption of the code and the continuance of the committee, to advise, interpret, and revise the code as may be found necessary.

R. V. Frost said that the code, to be effective, must have the support of the manufacturers, as the society had no police powers. He emphasized the fact that the society represented only 15% of the purchasing power as regards heating boilers. He said that, of the 16 manufacturers' representatives at the Pittsburgh meeting, 12 voted for publication of full test data and against the adoption of a 700° flue gas basis. He then moved the adoption of a substitute motion, returning the code to the committee with instructions to revise the code so that it would be based on grate area, fuel capacity and heating surface.

H. M. Hart said that he believed the heating contractors had developed a better code than the one here submitted, but said that he believed in the heartiest co-operation and wanted to see a satisfactory code acceptable to both organizations. Thornton Lewis read a communication from Prof. L. B. Breckenridge, Yale University, congratulating the committee on its code. L. A. Harding agreed, in general, with the committee, but said that it was a fallacy to attempt to rate all kinds of equipment on a temperature basis.

Dean Anderson injected his strong personality into the discussion with an attack on the code, saying that the matter was too important to rush, and that the committee had not yet succeeded in formulating a sound code; that it was too hard and fast. He felt that it was not the function of the society to formulate a selection code, and said that separate codes should be compiled to deal with cast-iron and steel heating boilers.

Replying, S. R. Lewis said that, while the steel boiler manufacturers were willing to accept a code based upon the physical characteristics of the boiler, the manufacturers of cast-iron boilers were not. F. B. Howell, in a long written discussion said that the A. S. M. E. code had aroused the ire of the manufacturers, and that it had been necessary to segregate heating boilers in the code. S. R. Lewis pointed out the unsatisfactory nature of trade literature, and said that the heating engineer or contractor could not use with intelligence the trade data as furnished today. Percy Nicholls said that it had been the early idea of the committee to formulate a code with an engineering foundation, and without commercial entanglement, and that in the face of repeated requests for suggestions no manufacturer had suggested the basis of a code or an alternative to the code as presented.

F. B. Howell took exception to this statement, and said that there were any number of engineers associated with boiler manufacturers, and present in the room, who could, in a single day, formulate an unassailable code that would be more satisfactory than the one presented by the committee. Thornton Lewis expressed his surprise that many such codes had not been submitted to the committee during the last eighteen months, during which the committee had used every possible method of securing suggestions. Prof. F. B. Rowley spoke in favor of the code, saying that, if it were thrown back to the committee, the situation ten years hence would be just what it is today.

Dean Anderson spoke on behalf of the manufacturers, saying that the society should not attempt to rate or select boilers, but to furnish data. He offered a substitute motion that the code be returned to the committee with no instructions.

The substitute motion by R. V. Frost was withdrawn, the substitute motion by Dean Anderson was carried, and the code was ordered returned to the committee without instructions.

Report of Committee on Code for Heating and Ventilating Garages

In presenting his report, Chairman E. K. Campbell stressed the fact that this committee was acting as an advisory committee to the committee of the National Fire Protection Association, and that, in preparing a code, the association was interested only in fire hazard to property, and not in the health or life-risk phase. Mr. Campbell asked for the adoption of the code "in principle," involving a consideration of air movement at the floor, designed to prevent the formation of gas pockets, which are the prime cause of explosions. The N. F. P. A., he explained, tentatively had adopted the report of its committee at the last convention, and only awaited the ratification of the portion sponsored by the committee of the A. S. H. & V. E. before making adoption final. After some discussion, clearing up points not understood, the motion was carried. It was suggested that any further comments or suggestions be transmitted to Mr. Campbell in writing.

Professor Rowley then outlined the paper prepared jointly with John Beal.

A Study of Dust Determinators

In presenting this paper, Professor Rowley explained that it was brought about by the desire of the filter code committee to learn more about the characteristics of the different available dust determinators in order intelligently to write a code. The investigations reported in this paper, also form part of the co-operative research being carried out at the University of Minnesota. Professor Rowley stated that the prime requirement of the present experiment was to study the various methods which have been proposed for determining dust in the air and, if possible, to select those best adapted to the practical development of a code. This work has not yet been finished, although the apparatus has been constructed and a considerable amount of experimental work has been done on the A-A determinator.

One of the first problems was to devise a method of mixing dust with air, which would give a reasonable degree of uniformity in the mixer. Professor Rowley explained the design and construction of a laboratory set-up that apparently produced satisfactory, continuous, and uniform dust mixtures.

A comprehensive study was made of the A-A determinator, and in this connection there was utilized the data reported by Margaret Ingels covering work carried out at the Bureau of Mines Laboratory. This study Professor Row-

ley reported, was particularly good for the purpose in hand, inasmuch as six determinators were used to simultaneously obtain six samples from the same air. By this method many of the irregularities in samples were eliminated.

In plotting these data, a considerable variation in constants was obtained, sufficient to seriously affect the accuracy of dust determination by this means. Professor Rowley then explained the development of a graphical method using the data obtained by Miss Ingels, through the use of which it was found that the average variation obtained was 4.42%. Referring to the present status of the investigation, Professor Rowley said:

"Even though each system in itself shows reasonable uniformity, there is a marked variation between the dust content as determined by the two methods now under consideration. Enough experimental work has not been finished to establish the complete relation between the two methods, but in general, for dust contents below 102, which was taken as a basis for comparison, the proposed system shows a lower dust content and for contents above 102 it shows a higher dust content. This relation between the two methods is fairly close to a straight line for the lower dust contents.

"The average dust content for all of our tests was 81 units with a maximum variation of 16% and an average variation of 10.1%. The average dust units as calculated by the Ingels' method are 7.9, which if converted over to the new method of units gives 112.0, instead of an average of 81.

"This second series of tests shows a greater variation than those determined with six different samples of the same air, as would be expected. The variation in the dust content, however, is not serious when determined by either method when considering the fact that there probably is a variation in actual mixture for the different samples. The fact that each method seems to give reasonably consistent results when taken by itself, and yet when the two methods are compared there are such wide variations, would indicate that further experimental work must be done to check results."

A brief discussion followed this paper, it being the consensus of opinion that material progress was being made in the problem.

L. L. Lewis then read his paper:

Methods of Air Distribution

In this paper* the author, an ardent disciple of Willis H. Carrier, discussed the problem of air distribution in theaters and auditoriums.

Following a brief discussion, the meeting adjourned.

*Editor's Note: This paper will be printed in full in the August issue.

Friday, June 29

This session, devoted almost entirely to the subject of infiltration through and around windows, was opened with a paper by F. C. Houghten and M. E. O'Connell.

Air Leakage Through a Pivoted Metal Window

This paper* was built around tests made during the Power Show in the Grand Central Palace, New York, using the set-up and equipment developed in previous tests made in the Southwestern Bell Telephone Company Building, St. Louis.

The window on which the tests were made was of the hollow-metal vertically-pivoted type with a perimeter of 20 ft. 4 in. The joints between the plaster and the frame were tight and appeared to offer little opportunity for frame leakage, but the window sash was not in good shape and fitted very loosely into the frame without weatherstripping. The test method was identical with that used in similar studies in St. Louis. In presenting the results in tabulated form, the author determined the amount and cost of radiation necessary to offset the heat loss due to leakage around the window perimeter, which clearly indicated that a window in this condition was a very costly element in considering the heating of the building.

Mr. Houghten said:

"It is of interest to compare the leakage through this window, which was noticeably loose-fitting, with the leakage through the windows of the Southwestern Bell Telephone Building as given in the report previously referred to. If this comparison is made on the basis of a 20-mile wind velocity, the unweatherstripped window in the Southwestern Bell Telephone Building leaked 120 cu. ft. per hour per foot of crack without weatherstripping, and 57 cu. ft. per hour per foot of crack with weatherstripping, as compared with 186 cu. ft. per hour per foot of crack for the window in the Grand Central Palace."

After a short discussion on some of the technical points involved Prof. J. E. Emswiler, of the University of Michigan, read the paper prepared jointly by himself and W. C. Randall.

Weathertightness of Rolled Section Steel Windows

Using material based upon laboratory tests and field surveys of various types of steel windows, the authors have prepared a paper showing that, on the average, steel windows manufactured of solid rolled sections are more weathertight than wood windows, notwithstanding a rather widespread opinion to the contrary. After discussing the factors influencing the weathertightness of windows and defining the nomenclature of the trade, the authors presented data, taken from laboratory tests, showing the leakage for various pressure differences combined with different crack openings of various types of Fenestra steel windows. These tests were made in the laboratory of the engineering research department of the University of Michigan, in a window testing apparatus similar to that used by the Research Laboratory of the American Society of Heating and Ventilating Engineers at Pittsburgh.

The tests indicate that when steel windows are calked with mastic, as is the common practice with residential casements, heavy section casements, heavy casement section projected, and possibly architectural projected, or grouted with cement, as is the common practice with industrial pivoted windows, the frame leakage is negligible. In figuring wood windows, the frame and elsewhere leakage is to be added to the crack leakage to obtain the total.

An interesting portion of the paper dealt with the study of actual pressure differences existing across windows in the university hospital. In this connection the authors stated:

"This whole question of pressure difference is fundamental to the problem of infiltration. Some excellent data on infiltration for all possible ranges of pressure difference are being accumulated, but much information about what pressure difference should be used in determining the probable amount of infiltration for any given case has not as yet been advanced. It would seem then that further research on the general subject should be directed at least in part toward this phase of the problem.

"Steel windows, particularly some types, can be made weathertight to almost any practical limit desired, but in view of what has been said, there would seem to be no economic justification in seeking to secure too great a degree of weathertightness. How far it is desirable to go depends upon the service of any given building. In office buildings and schools, ventilation is not necessary during the hours of non-occupancy, and infiltration then represents a heating loss, although, as has been pointed out, it may not represent a loss during the hours of occupancy. In a factory building, which may be operated 24 hours a day, and where temperatures are usually lower, infiltration in moderate amounts will mean no heat loss. In dwelling houses and apartments, where sleeping room windows are open during the night, infiltration in such rooms represents no loss during those hours, while in the daytime in cold weather, the only means of ventilation is by infiltration, of which there must be some; otherwise windows would have to be opened for that purpose. The point to be made is that infiltration in a moderate degree is in many cases a necessity, and not a source of heat loss, and amounts representing heat savings by reduction of infiltration should be considered with considerable caution."

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W. N. Richtmann and C. Braatz, of the University of Wisconsin, submitted a paper on

Effect of Frame Calking and Storm Windows on Infiltration Around and Through Windows

In presenting this paper, which is based on a series of tests carried out at the University of Wisconsin as part of the co-operative agreement with the A.S.H. & V.E., the authors state:

"These tests have been made to show the effect of calking the crack between the brick wall and window frame, and the effect of applying storm sash to the window. Each group was divided into two parts. The infiltration was determined through the crack for a window set in a plain 13-in. brick wall and for the same crack after the wall had been plastered. The storm sash was applied in two methods to a window which had a very small crack and clearance, and to a window with a crack and clearance of more or less average size."

"The application of storm sash does not materially decrease the infiltration of a tight fitting window, but does give a large saving if the crack and clearance of the window is large. The application of a wool strip between the frame and storm sash reduced the infiltration appreciably.

"The storm sash applied by means of the four turn buttons reduced the infiltration much more than those applied by means of the hook and eye suspension arrangement.

"The infiltration through the crack between the brick wall and window frame for a plastered wall is about 40% of that through the same crack on a plain wall. The leakage may be as great as the leakage through the sash perimeter of the window.

"Data on runs which duplicate previous tests made at the Research Laboratory check very closely with the data from that laboratory."

Refrigeration as Applied to Air Conditioning

The adaptation of refrigeration, as formerly applied in ice making, to the more recently developed field of dehumidifying and air conditioning, formed the subject of R. W. Waterfill's paper, which was devoted to an explanation and comparison of the different systems and mediums used.

After briefly outlining the thermodynamics of the problem, Mr. Waterfill explained the differences between refrigerating requirements for ice making and similar applications and refrigeration for air conditioning including dehumidificaton.

"Refrigerating fluids," said Mr. Waterfill, "are merely heat-carrying mediums which, during their cycle, absorb heat at a low temperature level, are compressed by a heat pump to a higher temperature, where they are able to discharge their absorbed heat together with that added during the pumping, to the condenser cooling water. The ideal refrigerating medium would be one which could discharge to the condenser all the heat which it is capable of absorbing in the cooler."

The last paper on the program, an unusual but interesting one, was read by D. E. Humphrey, engineer, Goodyear Tire & Rubber Company.

Heating and Ventilating Problems of Gas Cell Manufacture for Air Ships

Requirements of air conditioning in the manufacture of cells for air-ships was the subject of this paper. The author described the construction of lighter-than-air craft, such as the Los Angeles, in which the helium, hydrogen, or other gas used is confined in from 16 to 20 gas bags, constructed of goldbeater's skin. The outer linings of the large intestines of the ox, are received from the meat packers in pieces about 30 in. long and 8 in wide. It required over a million of them for such a ship as the Los Angeles. Mr. Humphrey described the process by which these are prepared for use and fabricated into the necessary containers. He then described the room in which this work is carried on, a huge space with over half an acre of floor space and roof area with a volume of 450,000 cu. ft. The paper dealt with the heating and ventilating problem involved in the operation of this department. This problem relating, of course, to a very small industry, is a difficult one from a technical standpoint.

RESOLUTIONS

Among the resolutions offered and passed was a very warm personal tribute to the memory of Walter S. Timmis by Willis H. Carrier who, in a brief talk supplementing the resolution, said that the foundation upon which his business was built came in the form of suggestions and inspiration from Mr. Timmis.

By vote on a motion by L. A. Harding, seconded by C. V. Haynes, the secretary was instructed to send to Alfred Kellogg, chairman of the committee on rating low-pressure heating boilers, the following telegram:

> "The society in session desires to express its appreciation of the work of the committee on code for boiler rating and selection and its confidence that the complete report, when presented, will meet with a general acceptance by all the organizations interested. Please accept our congratulations on your election as chairman of the Associated Technical Societies of Boston."

Another "in memoriam" resolution was offered by Edwin S. Hallett on the death of Prof. J. H. Kinealy, of Washington University. Following the transaction of some routine business, the meeting was declared adjourned *sine die*.

ENTERTAINMENT

Under the able direction of C. R. Ammerman, of Indianapolis, chairman of the committee on arrangements; J. D. Hoffman, chairman, reception committee; C. H. Hagedon, chairman, ladies' committee; F. E. Fensternmaker, golf tournament committee; and C. N. Warren, chairman, entertainment committee, a program was provided for the visiting members, their ladies and guests that threatened to endanger the technical sessions. The program included a luncheon for officers and authors of papers, preceding the Tuesday session.

There was an informal dinner and dance on Tuesday evening, a golf tournament for the research cup on Wednesday afternoon, ladies' bridge and tea at the same time, the showing of a moving picture film, taken at the White Sulphur Springs and New York City meetings, a golf tournament for the men on Thursday afternoon, and a trip to the Marengo Cave for the ladies on Thursday afternoon.

On Thursday evening the semi-annual banquet and dance was held in the main dining room, the guest speaker being Dr. William Prentice Dearing, president, Oakland City College, Oakland City, Ind. Doctor Dearing delivered an inspiring address on the subject of "The Other Fellow" in which he dwelt on the fact that only by consideration of the other man's feelings, and co-operation with him, would progress be continued. Following the dinner, the research cup was presented to L. J. Pitcher for the coming year and a number of less important trophies were tendered to class winners. The prizes also were presented to the winners in the tennis tournament, the principal cup going to T. J. Duffield, while other prizes, in some cases ludicrous, were awarded.

Kansas City Chapter

Among the speakers at the May meeting of the Kansas City Chapter, held at the Ivanhoe Masonic Club, May 15, were Ernest Jones, who spoke on ventilation and refrigeration; E. K. Campbell, who spoke on the Garage Heating Code; F. F. Dodds, whose subject was radiation, and B. C. Naylor on insulation. C. W. Plass spoke on the subject of fuel oil.

Newly-elected officers for 1928-1929 are: President, Herman C. Henrici; vice-president, C. C. Clegg; secretary, Ray Mason; treasurer, Carl Weiss. Board of governors: L. W. Millis, Frank W. Wise and F. A. Kitchen.

St. Louis Chapter

Prof. A. P. Kratz was the principal speaker at the May meeting of the St. Louis Chapter, held at the Roosevelt Hotel, May 2. He discussed the ventilation of the Holland Tunnel; efficiency of radiators with and without enclosures, and data secured in the warm-air research laboratory of the University of Illinois.

Studying the Heating Load

Analysis of 1927-8 Heating Load Brings to Light Some Interesting and Valuable Facts.

By P. E. Fansler

Associate Editor, THE HEATING AND VENTILATING MAGAZINE

CONCEPTION of an idea of determining the heating load for several hundred cities and drawing upon a map of the United States lines of equal heating load, or "Iso-Degree-Days," did not contemplate the widespread and varied application of the data thus presented. During the last two years evidence has accumulated showing undreamed-of applications, by heating engineers, insulation manufacturers, gas interests and oil dealers.

Extending the practice of almost a quarter of a century of presenting essential weather data during the heating season, THE HEATING AND VENTILATING MAGAZINE began, at the opening of the heating season just past, the presentation of degree-day graphs for each month in the heating season. At this time a full-page graph brings together the several monthly charts into a graphic picture of the heating loads for five representative cities.

A study of this set of graphs enables one to visualize, as could be done in no other way, the flow of heat demand. Look, for instance, at the so-called "cold snap" that swept over the country the first week in January. Of the cities represented, St. Louis is the most westerly. Observe that this cold wave began two days before January 1, when the daily heating load jumped from 12 d-d. (which admittedly stood for a warm day) to 66 d-d., an increase of 550% in three days.

Follow this cold wave to Chicago, where an a'most identical peak occurred within a few hours. Then turn to Pittsburgh, and see a duplicate except for the fact that it is a day later. Move on to New York, and find a similar, but lower and later peak, showing the lag in time and the decrease in intensity. Turn, then, to Boston, and see the still later and lower "snap."

In the same way look at the cold week early in November, the graphs of which resemble elevations of modern terraced skyscrapers. It would seem that graphs of this kind would constitute a logical basis for determining a "base" upon which computations for radiation could be made.

As a contrast to the consideration of these positive heating loads, observe the warm spell that dropped the heating load in St. Louis from 25 d-d. on March 30 to 0 d-d. on April 1, this warm spell lasting two days and then slowly vanishing until the load reached 26 d-d. on the 6th. Following this warm spell across the country, we see that it reached Chicago on the 2nd, when the heating load became 0 d-d., a drop from 40 d-d. in less than a week. Pittsburgh was relieved of the necessity of heat on the 3rd, after quite a cold snap. In New York the heating load dropped to zero on the 4th and the warm wave struck Boston on the 6th.

Another interesting and valuable chart can be delineated by separating the heating load for a heating season into its monthly components. This has been done for the 1927-8 heating season, for the same cities, and is presented on Page 110. Solid lines represent monthly heating loads in per cent of the normal annual load. Dotted lines are in per cent *of the* 1927-28 *heating load*. It is evident, from this graph, that variations from the normal, except in a few cases, are much smaller than are popularly supposed. Taking Chicago, for example, the monthly heating loads, beginning with September, bear the following relations to the normal monthly loads: +1.3%, —1.2%, —1.2%, +1.2%, —0.8%, —0.6%, —0.7%, —1.5% and +0.4.% Surely such variations are not sufficient to justify the statement that: "It's been an unusually easy winter." In New York, to cite another example, the last heating season was regarded as being much below normal; it seemed almost a joke to call it "winter." But when the actual heating load was determined, it was found to be only 208 d-d. below the normal, a matter of but 3.9%.

Again, to look at it from another angle, if the normal heating-season load is broken up into its monthly component parts, and if the 1927-8 load likewise is segregated, and if the latter figures be subtracted from the former, there will be obtained the monthly variations, in *degree-days*, from the normal. If these be converted into percentages *of the normal*, it is found that, as a rule, the widest variations occur at the *ends* of the heating season, and that, during the cold months, *the variation in percentage is comparatively small.* Such figures, for New York, beginning with September, are: ∞, —16%, —21%, —6.5%, —6.6%, —2.4%, —3.5%, +10.6%, +47.7% and —3.9%. For Chicago they are: ∞, —29.5%, —9%, +8.1%, —0.5%, —4.7%, —2.6%, +16% and +13%. It is to be noted that, in each case the infinity percentage is due to the fact that the normal load is zero; consequently even a single d-d. would be an infinity percentage increase.

It is obvious that the area included between the base line and the degree-day curves that have been discussed accurately represents the heating load for any given locality. It must be equally evident that the peaks shown on these curves, representing actual temperatures shown at the right hand edge of the degree-day chart on Page 109, may not be used as a basis on which to determine the radiation required for any enclosure. Among other reasons, two important ones may be cited to cover this point. In the first place, these data are taken from mean temperatures of maximum and minimum for each day. Therefore, the low temperature that may obtain for several hours is not indicated by this mean. Again, it will be found, particularly in cities located on large bodies of water where sudden changes of temperature occur, that the heat storage of a building mass may be a more important factor in determining required radiation and boiler capacity than minimum temperature at that point.

The normal heating loads for the entire year and the d-d. for 1927-8 are as follows:

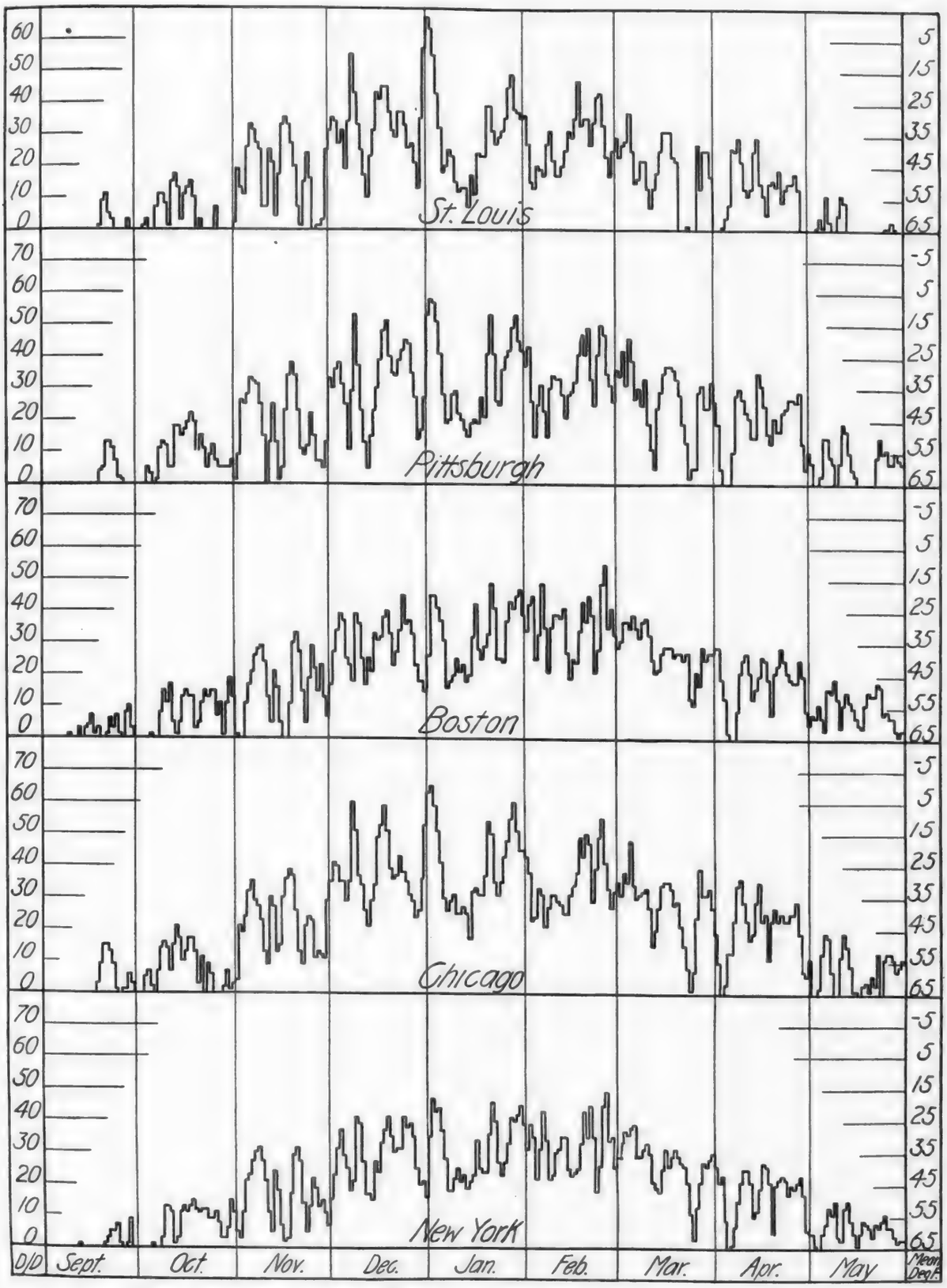
	Degree-days		
	Normal	1927-8	Difference
St. Louis	4583	4423	—160
Chicago	6007	6096	+ 89
Pittsburgh ...	5327	5441	+114
New York....	5303	5095	—208
Boston	6145	5418	—727

It is but natural that data such as these will increase in value as the years go on, due to added number of annual analyses.

Error in Degree-Day Summations

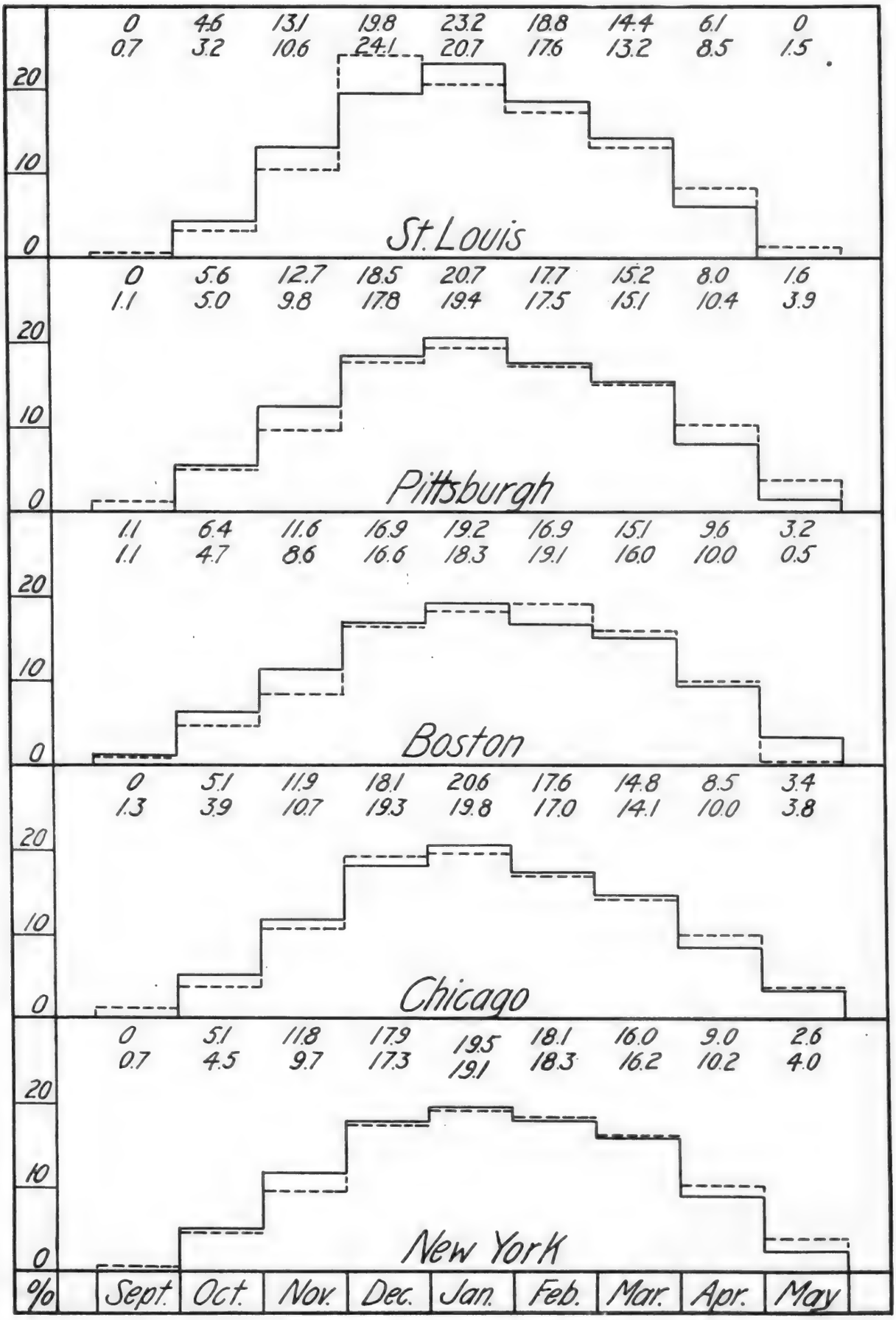
Due to an error in tabulation, the total accrued degree-days given with the heating load charts published in the March, 1928, and following issues, were incorrect for each of the cities represented. The d-d. for each month are correct.

The totals for the entire heating season can be obtained by adding the monthly d-d. as published from month to month, together with September figures, as follows: St. Louis, 32; Chicago, 76; Pittsburgh, 56; New York, 34, and Boston, 61; and May, St. Louis, 49; Chicago, 232; Pittsburgh, 211; New York, 207, and Boston, 299; figures for this last month were not available when the last graph was printed.



Heating Loads of Five Cities for Which Weather Reports Have Been Published in The Heating and Ventilating Magazine During the Past 23 Years.

These graphs are plotted against ordinates in degree-days as indicated in the left margin. The inverse figures in the right margin represent mean temperatures in degrees F., the 65° mean temperature corresponding with 0 degree-days.



Heating Load for Each Month in the Heating Season Expressed in Per Cent of Total Annual Heating Load.

For each city solid lines and figures in top rows are percentages of normal heating load. Dotted lines and figures in lower rows are percentages of the heating load for the heating season of 1927-8.

How Would You Do It?

Question No. 11

What size closed expansion-tank would be required on a forced circulation hot-water system in which the total pumping head is 40 ft., the gravity head 10 ft., and the allowable difference in pressure in the closed tank 5 lbs.? Assume that the system contains 5500 gal. of water, and, when filled up cold, the water is at 40° F.; that the highest temperature of the water is 212° F.; also that the expansion tank is connected to the discharge side of pump. If compressed air is available, how much could the tank capacity be reduced, and what would be the initial air pressure used?

FIRST it is necessary to see how much expansion must be taken care of. Water at 40° F. heated to 212° F. expands approximately 1/23 of its volume, (specific volume at 40° F. is 0.01602, and at 212° F. is 0.0167) consequently 5500 gal. will expand

$5500 \times 1/23 = 239$, or, say, 240 gal., the quantity of water that must be cared for in the expansion tank.

We now must determine the size of tank which will permit the entrance of 240 gal. of water and have the air pressure increase only 5 lbs.

With the pump operating there will be a pressure exerted on the line, at the outlet of the pump, amounting to the gravity head plus the pumping head or 10 ft. + 40 ft. = 50 ft., or

$50 \times 0.43 = 21.5$ lbs. gauge pressure.

Now if water at 21.5 lbs. gauge pressure is admitted to a closed tank filled with air at normal atmospheric pressure the air in the tank will be compressed until its pressure equals and counterbalances that of the water. When the water pressure is 21.5 lbs. gauge the absolute pressure is

21.5 lbs. + 14.7 lbs. = 36.2 lbs. absolute.

But the air originally in the tank was at atmospheric pressure which was 14.7 lbs. absolute. Consequently the entering water will compress the tank air from 14.7 lbs. absolute to 36.2 lbs. absolute and, since the volume is inversely proportional to the pressure, the relative volume occupied by the air when it has been compressed will be

$\frac{14.7}{36.2} = 0.406$, or approximately 41% of the original volume.

Under this condition the air occupies 41% of the volume of the tank and the water the remainder, or 59%. The problem states that when the system is heated up (and the water expanded about 1/23 of its volume, or 240 gal.) the pressure exerted by the tank must not be over 5 lbs. additional, which would make the absolute pressure, when the system was hot,

36.2 lbs. + 5 lbs. = 41.2 lbs.,

and the volume occupied by the air at this increased pressure would be

$\frac{14.7}{41.2} = 0.356$, which is, approximately, 36%.

This shows that, when the system is cold, the air in the tank will occupy 41% of the total volume and when the system is hot the air will occupy 36% of the total volume making a difference in volume of

41% — 36% = 5%,

and this 5% decrease in the volume of the air under the heated condition in the system represents the amount of water which would enter the tank during the time the water in the system was expanding.

It already has been calculated that this amount is about 240 gal. Therefore 240 gal. represents 5% of the total tank capacity, and the tank would have to contain

$$\frac{240}{0.05} = 4800 \text{ gal.}$$

The second portion of the question asks how much the tank capacity could be reduced by using initial air pressure, and what the maximum air pressure would be. It has been computed that the total head on the system, when cold, is 36.2 lbs. absolute or

36.2 lbs. — 14.7 lbs. = 21.5 lbs. gauge,

and, if air is admitted to the tank until 21.5 lbs. gauge is reached, there will be just enough air in the tank to counterbalance the water pressure in a cold system. The compressed air, in this case, will have an absolute pressure of 36.2 lbs. and will occupy 10% of the tank volume, but when the system is heated the absolute pressure of the air will be 5 lbs. more or

36.2 lbs. + 5 lbs. = 41.2 lbs. absolute.

But the volume occupied by the air again will be inversely proportional to the absolute pressures, or

$\frac{36.2}{41.2} = 0.878$, which is, approximately, 88%.

Then, to compress the air from 100% of the tank volume down to 88% of this volume, and which requires an additional pressure of 5 lbs. will result in

100% — 88% = 12% of water entering the tank.

As this amount of water is 240 gal., the total tank capacity must be

$$\frac{240}{0.12} = 2000 \text{ gal.}$$

The initial air cannot be in excess of the water pressure, and if it is less than the water pressure a larger tank will have to be used. This analysis shows that the economical initial air pressure will be 36.2 lbs. absolute (or 21.5 lbs. gauge) and that the expansion tank can be reduced to 2000 gal. capacity when this initial air pressure is used.

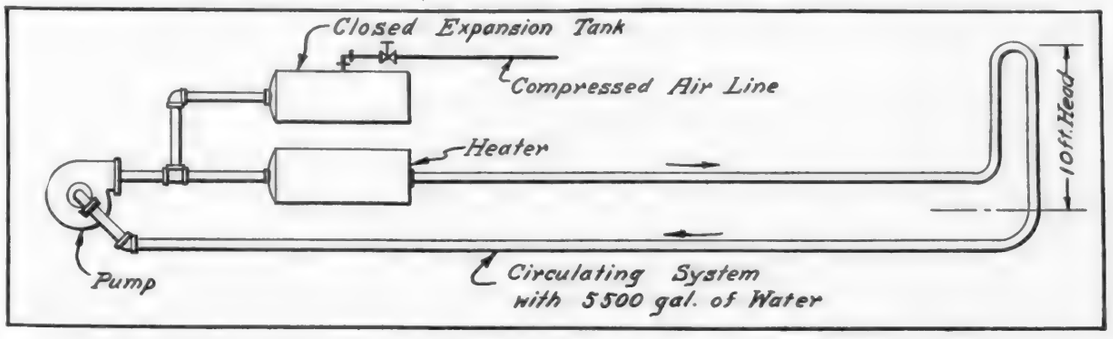
PROBLEM FOR NEXT MONTH

Question No. 12

What horsepower motor and what energy consumption per 24-hour day will be required to circulate 1500 gal. per min. in a forced water-heating system having the piping sized on the basis of 1-lb. drop in pressure per 100 ft. of pipe run if there are

12 8-*in.* 90° *ells*
6 6-*in.* 90° *ells*
20 4-*in.* 90° *ells*
10 3-*in.* 90° *ells*

and the actual length of run is 2000 linear feet?



Problem Presented in Question 11

Williams Oil-O-Matic Holds Banner Convention

NEW products in the form of an atmospheric oil burner for small homes and an oil-fired domestic water heater were the focal point around which was built the fourth national convention of the Williams Oil-O-Matic Heating Corporation, held in Bloomington, Ill., June 25-26.

The new atmospheric burner is known as Dist-O-Matic. An attendance, which exceeded that of last year by a generous margin, marked the meeting as the most successful that the company has held.

Two of the most important changes in sales policy were the announcements that, hereafter, the company's products may be purchased by dealers on a 90-day estimate of requirements, and that the company's line now may be obtained by dealers in smaller quantities and at higher discounts. The quota system will be retained. In cases where oil-burner dealers do not desire to take all the other products of the company, it was announced that no opposition would be imposed upon them to do so, but that, in any event, agencies will be established in each locality now served by the company, to market its new products.

Among the speakers at the convention were: President C. U. Williams, Vice-President and Secretary Walter W. Williams, and R. D. Marshall, of the home office, who discussed in detail Dist-O-Matic and Dis-O-Stove, their mechanics and markets. John P. Roach, president of the Roach Advertising Company, detailed the plans under way for advertising and publicity. General magazines, architectural and engineering papers, newspapers, direct mail, radio and billboards, all will figure in the campaign.

Throughout the meeting the enthusiasm and close attention of the record-breaking crowd of delegates testified to the confidence felt in the outlook for the coming year.

Directors of the A. O. B. A. to Meet

Board of directors of the American Oil Burner Association will hold its next quarterly meeting at White Sulphur Springs, W. Va., July 10. A special executive meeting of the burner-manufacturer members of the association also will meet at this place July 9.

Boston Oil Burner Association Joins A. O. B. A.

It was unanimously voted at a meeting of the Boston Oil Burner Association, held May 8, that the local association should apply for membership in the American Oil Burner Association. Members of this group are: Ballard Oil Burning Equipment Company, Boston Heating Company, Buckley & Scott, Inc., Caloroil Burner Corporation, Electrol Sales Company, Hardinge Oil Burner Corporation, H. E. Holbrook Company, Petroleum Heat & Power Company, Quaker Mfg. Company of N. E., Teplow Service of Boston, Timken-Detroit Company and the Wayne Company.

Chicago Oil Burner Association

The June meeting of the Chicago Oil Burner Association was held at the Allerton Club, June 12, with 57 members and guests in attendance. In the absence of T. C. Kyle, B. K. Eaton reported on the progress of the new Chicago ordinance, and it is to be hoped that this soon will be put into effect with a reduction in the cost of permit fees.

E. W. Miles, of the members' complaint committee, reported on the question of the servicing of oil burners by oil companies. A particular case was referred to, whereby the servicing by an oil company was justified in that the burner dealer, now defunct, claimed that service demands were made necessary by the supplied oil being contrary to specification. The board sustained the action of the oil company. Speaking for the oil division Mr. Miles related in detail the vast new oil resources that had become available in the past few months and pointed out that fuel oil was never cheaper before than now, and that this should be utilized by oil-burner dealers as an excellent selling argument.

J. M. Knox, speaking for the boiler division, told of the excellent selling methods of the gas industry and urged that the sale of oil burners in every instance, be conducted on the same intensified plan as the gas industry.

Frank Gaylord presented the film, "The Heat Thief," prepared by the Hoffman Specialty Company.

President Straight extended an invitation to the members to attend the Williams Oil-O-Matic Convention, at Bloomington, Ill., June 25-27.

Springfield Association Formed

An association has been formed in Springfield, Mass., by dealers in oil-burning equipment. W. J. Harter, manager of the Dealers' Division of the American Oil Burner Association, gave a talk on the advantages of affiliating with the national association. Companies represented at the meeting were: Automatic Oil Heating Company, Ballard Oil Burner Company, Burden-Bryant Company, Harvey-Whipple Oil Burner Company, W. E. Haskell Company, Pease Company, Preferred Utilities Company, Charles Rice, Inc., Smith & Roberts Company and the Timken-Detroit Company.

Hart Junior Oil Burner Approved by Underwriters

The Preferred-Hart Junior or Type D-O burner has been approved by the Underwriters' Laboratories, to burn fuel oil as low as 28° Baume. This oil burner primarily has been designed for warm-air furnaces and round boilers in small homes. The burner is silent in operation, simple to install, and lower in price than the other three burners in the Hart line, manufactured by Preferred Oil burners, Inc., Peoria, Ill.

Prizes Awarded by Electrol

Winners of the yearly distributor-dealer contest have been announced by Electrol, Inc. of Missouri, St. Louis. The silver distributor plaque was awarded to Harvey-Whipple Oil Burner Co., Springfield, Mass., and the dealer plaque went to Cobin & Cocks, Port Washington, L. I.

Harvey-Whipple Oil-Burner Dealers and Salesmen Meet

Dealers and salesmen of the Harvey-Whipple Oil Burner Co., Springfield, Mass., distributors of Electrol oil burners in part of Massachusetts and Providence, R. I., held a meeting at the Hotel Worthy, Springfield, May 3.

R. S. Beale, director of National Sales, Electrol, Inc. of Missouri, discussed the plans for the coming year. Among the speakers at the banquet held in the evening, were W. O. Harvey, president of the company; Lionel L. Jacobs, vice-president of Electrol, Inc.; L. H. Van Ness, president, Mercoid Corp., Chicago; N. J. Allaben, vice-president, Mercoid Corp.; and G. D. Kingsland, vice-president of the Minneapolis-Honeywell Regulator Co., Boston.

Huge Market for Gas-Fired Water Heaters

Seven-hundred thousand electric washing machines were sold in the United States last year, at a cost of approximately $105,000,000, this being 88c per capita. These data would indicate that gas-fired domestic water heaters have a tremendous potential market.

The gas water-heater is in a class of its own in that it is the greatest of gas load builders, it is comparatively high in first cost and is more costly in operation than other gas appliances. For these reasons, it is entitled to special treatment in its sales development.

It is an interesting fact that there were installed, last year, approximately 350,000 new gas heaters, this being 150,000 in excess of the water heaters sold during the previous year.

It is apparent that the best sales effort so far expended have not touched the surface, although certain outstanding instances and real progressive and forward-looking attacks are exceptions that prove the rule.—*From a paper by W. C. Pearce, read at the Fifth Annual New York Regional Sales Conference of the American Gas Association.*

British Industrial District Adopts Smoke Standards

The first meeting of the newly-constituted Manchester and District Regional Smoke Abatement Committee, which was held recently in Manchester, formulated a definition of "black smoke," when applied to smoke issuing from a chimney top. It was agreed to make two minutes' dense "black smoke" in a single half hour an offence. This standard, which has been enforced in Manchester for the past 40 years, was recommended as following the Smoke Abatement Act which came into force in Great Britain last year.

The committee also decided that the term "black smoke" should apply to "smoke of such density that light could not be seen through it as it issued from the chimney top." As far as possible, the line of vision of the observer should be at right angles to the direction in which the smoke is travelling.

The committee, which represents 72 local authorities out of the 103 in the Mersey and Irwell industrial districts, replaces the old Regional Committee. It covers most of the Lancashire manufacturing centers, having a total population of nearly 3,000,000.

Heating Domestic Water

Two hundred thousand domestic water heaters, valued at $20,000,000, were installed during the year 1927, according to reliable data. This was a tax of 15c per capita. It is interesting to compare these statistics with those of the vacuum-cleaner industry. Last year America made and sold 1,028,000 vacuum cleaners, having a retail value of $61,000,000, this being 51c per capita.

Advance in Boiler and Radiator Prices

Recent business in the heating and plumbing materials' market was featured by the announcement of manufacturers of boilers and radiators of a price advance of approximately of 5% on boilers and about 10% on radiation.

British Committee Reports on Fan Standardization

As long ago as February, 1922, the Institution of Heating and Ventilating Engineers of Great Britain, realizing the unsatisfactory state of affairs relating to terms used in fan-work, the methods of testing fans, the instruments used in connection therewith, and the information given in manufacturers' catalogs, appointed a fan standardization committee to investigate thoroughly the whole subject. As a result of its five years' work this committee has just issued a report, which generally is accepted as authoritative.

Opening sections of this report deal with definitions of the component parts of the fan and of the quantities measured in tests. Notes on methods of measuring pressures and velocities then are dealt with, after which full directions are given for determining the average velocity of flow in large air ducts, with further notes on the conduct of tests. On the question of tolerances to be admitted in tests, the committee suggests that the terms of a specification shall be considered as satisfied if, at specified delivery, the speed does not differ by more than 10% from that specified, and the power absorbed does not differ by more than 5% from the specified power. The volume of specified speed and head alternatively shall be not less than 90% of that designated.

Construction Started on Pittsburgh Heating Station

The new Twelfth Street steam heating station of the Allegheny County Steam Heating Company, Pittsburgh, Pa., a subsidiary of the Duquesne Light Company, is in the process of construction. Steel now is being fabricated; the first boiler is scheduled to begin operation November 15, and the second boiler will be in operation on January 1, 1929.

Each boiler will have a capacity of 300,000 lbs. of steam per hour, with a peak capacity of 350,000 lbs. per hour for short periods. A tunnel approximately 3000 ft. in length will contain the mains which connect these boilers with the distribution system now served by the Stanwix steam heating plant. The tunnel proper is more than three-quarters completed.

Seventh Annual Power Show

Seventh National Exposition of Power and Mechanical Engineering will be held at the Grand Central Palace, New York, December 3-8, simultaneously with the annual conventions of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers. During last year's Power Show there were five hundred exhibits and a general attendance of 100,000.

It is interesting to note that of the 25,000 registered visitors, over 6000 were officers of corporations or plant owners and sales executives, 5000 were engineers and designers, 4400 were technical men bent on visualizing the latest achievements of mechanical equipment which were displayed.

Last year the heating and ventilating exhibits dominated the display, and it is anticipated that this year the preponderance will be even more marked.

Deaths

James D. Hurd, president of the New York Steam Corp., New York, died June 23, at his home in New York, after an illness of several months. He was 47 years of age. Mr. Hurd attended Hopkinson Smith School in Massachusetts and Harvard University. He finished Harvard with the class of 1903, and came to New York to become associated with the Guaranty Trust Company as assistant secretary. In 1921, Mr. Hurd resigned to become president of the New York Steam Corporation.

Thomas G. Mouat, president of the Mouat Vapor Heating Co., Cleveland, O., died May 13, at the age of 61. Mr. Mouat was born in Edinburgh, Scotland, and came to this country when he was 16 years old, learning the heating and plumbing trade in the shop of his uncle, John D. Mouat, at Detroit. In 1890, he became superintendent of E. H. Jones & Company, heating and ventilating engineers and contractors of Cleveland. Mr. Mouat succeeded to this business in 1899, and in 1909, he developed the Mouat vapor heating system.

Frank C. Bradbury, assistant general manager of sales, Crane Co., Chicago, died at the Presbyterian Hospital, June 15. He was born in Bridgeport, Conn., 53 years ago. Previous to his association of 17 years with the Crane Company, Mr. Bradbury was connected with the Harry Murphy Co., Philadelphia.

Gustav H. Koven, president of L. O. Koven & Bro., Jersey City, N. J., died at the age of 56, June 12. Mr. Koven, in addition to being the head of this company, manufacturing range boilers, was president of the International Overseas Corporation, vice-president of the Hoboken Home Savings Bank and director of the Trust Company of New Jersey.

Thomas H. Hutchinson, for 30 years a manufacturers' agent at 110 East 34th St., New York, died at his home in Richmond Hill, L. I., May 15. Mr. Hutchinson was associated with the heating and plumbing field for almost 50 years, having joined the old firm of Miller & Coates in New York, in the early '80's. He also owned, with his son, Warren, the Thomas Warren Company.

Edward H. Giles, manager of Pierce, Butler & Pierce Mfg. Corp., in the Philadelphia and Baltimore districts, died at his Philadelphia home, April 27, at the age of 64. Mr. Giles was one of the pioneers in the boiler and radiator field in the east, having been associated with the Pierce company for 44 years.

Correspondence

Conducted by T. W. Reynolds

A Comparison of Heating Systems—Vapor, Water and One-Pipe Steam

EDITOR HEATING AND VENTILATING MAGAZINE:

I will appreciate it very much if you will furnish me with a detailed description of the principle upon which vapor and hot-water systems operate, together with the cost of such systems.

AUGUST J. BECHTOLD.

Havre de Grace, Md.

Vapor systems are special types of the gravity steam system operating essentially as a one-pipe system when equipped with one-way or non-return air valves, except that each radiator has two pipe connections, with some provisions (usually a thermostatic trap) for preventing the escape of steam from the radiators, and drips into the dry-return main. A further difference, the installation of a single large and sensitive quick-vent valve, located in the basement, permits the rapid venting of air from the system. In the ordinary gravity steam heating system the air must be slowly compressed, as the pressure increases, until the pressure becomes sufficient to force the air through the small pin holes of each radiator air-valve.

A graduated type of valve may be used on the supply end of each radiator so that, whenever desired, the amount of steam delivered to the radiator can be varied within certain limits. A damper regulator of a sensitive type is used, and provision is made for a more positive return of condensation to the boiler.

Vapor systems have been on the market for at least 25 years, but the slow evolution of these systems indicates that only within the last three or four years have their workings generally been understood and appreciated. Even to-day it is safe to say that a full understanding has not yet been reached as to what actually takes place in practice, rather than in theory, in a vapor system.

It is common to designate a vapor system by some such name as controlled heat, vapor, vacuum, vapor vacuum, vacuum vapor, air-line, atmospheric, modulated or thermograde system of heating, but only such systems as normally operate on a slight vacuum, which is self-induced without the aid of any power-driven pump or similar positive mechanical device, may properly be termed vapor systems.

In general, such a system has the following advantages:

Air is prevented from being readily drawn back into the system; therefore, as the radiators cool off, the resulting vacuum in the radiators pulls vapor out of the boiler instead of air from the rooms, because the vacuum lowers the boiling point of the water. This causes the water in the boiler to continue to give off steam vapor for circulation throughout the heating system. The heat in this vapor is utilized to maintain room temperature.

It is unnecessary to heat the water to 212° in order to generate steam as the water in such a system will boil at some lower point.

Vapor systems induce economy in fuel due to control of heat emission from the radiators. This control is desirable due to the fact that there are but few cold days in the average heating season, making it evident that the average seasonal temperature of the steam supplied should not be 212° or above, but much lower, possibly 160° to 170°.

During ordinary weather the fire can be banked for hours and still a sufficient amount of heat at low temperature will be circulated throughout the radiators, maintaining the desired uniform temperature within the rooms. The lower temperature reduces the losses of heat from piping and eliminates overheating of the rooms.

Vapor systems are easy to control, responding rapidly to demand, as the heat loss varies with sudden changes in outside temperature, giving either the intense heat of a steam system in severe weather, or the milder heat of a hot-water plant in moderate weather, and this without the additional radiation that would be necessary with a hot-water system.

The successful and satisfactory operation of a vapor system depends, to a great extent, upon the proper operation of the damper regulator, and extreme care should be used in connecting the chains and pulleys of a damper regulator so that there will be as little resistance as possible to its operation. The weights should be perfectly balanced so that movement will be effected by the least possible pressure.

The radiators are provided with manually operated valves which may be so used as to modulate the room temperature by controlling the quantity of water flowing into the radiators. A further control is obtained by regulating the temperature of the water at the boiler by means of a thermostatic device which automatically closes the drafts and checks the fire whenever the desired temperature is reached and opens the drafts again whenever the temperature drops.

The first cost of vapor and hot-water systems is about the same, with any difference in favor of the vapor systems, especially on large jobs where the cost of the return and vent specialties at the boiler is less in proportion to the total cost. The cost of operation is less for vapor than with hot water.

Cause of Water Hammer in Two Different Heating Systems

EDITOR HEATING AND VENTILATING MAGAZINE:

Perhaps you can point out just what is wrong in two heating systems that I laid out, each of which is troublesome, due to surging and water hammer. The radiator shown in Fig. 1 seems to be well above the water line, and in Fig. 2 the highest run of the return over the portion of the cellar marked unexcavated is just above the boiler waterline.

Harrisburg, Pa. F. A. R.

The trouble in Fig. 1 probably is due to intermingling of steam and water in the lowest horizontal portion of the branch return from the radiator, at the point where it connects to the drip from the main. Water in the boiler will fluctuate somewhat, causing the branch return to fill with steam as the boiler water-line lowers, and with water as the water line rises again. Obviously, the remedy is to connect the drip pipe at some other point, or else make the return connection from the radiator at a point far enough down to keep this pipe always full of water.

In Fig. 2 the trouble is caused by fluctuations in the boiler water-level which, at times, rises so as to fill the air-bound upper horizontal return. If this portion of the return is not so long as to cause surging of considerable water it should function well enough, provided it is relieved of air by venting with an air valve at point "A."

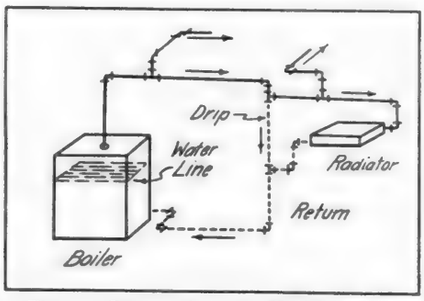


Fig. 1. Connections in Heating System which Caused Water Hammer

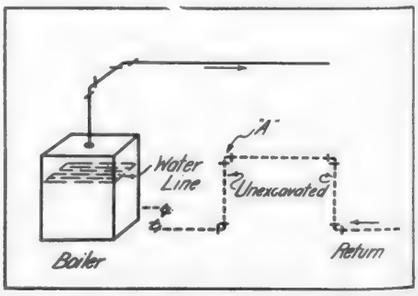


Fig. 2. Heating System which Became Air Bound in Elevated Return

OIL-FUEL SPECIFICATIONS OF THE A.O.B.A.

Data presented on this, and the five following Data Sheets, form the basis of a serious attempt to bring about a condition of standardization in the specification of domestic oil fuels. It has been recognized for a long time that gravity does not provide a definite classification of oil fuels, and, during the last three years, the American Oil Burner Association has made a study of the various characteristics of oil. With the data that were collected in making this study, the committee formulated and the association has adopted a set of specifications covering the various grades of oil fuel that are in use today.

The following table gives the specification number and name, together with the old designation and approximate gravity range.

CLASSIFICATION

A.O.B.A. DESIGNATION		OLD DESIGNATION	
Specification Number	Name	Gravity Range, A.P.I.	Name
1	Furnace oil—light	48°-44°	Light kerosene
		44°-40°	Kerosene
		40°-36°	Distillate
2	Furnace oil—medium	36°-32°	Gas oil
3	Furnace oil—heavy	32°-28°	Light fuel oil
4	Fuel oil—light	24°-28°	Medium fuel oil
5	Fuel oil—medium	24°-18°	Heavy fuel oil
6	Fuel oil—heavy	18°-12°	Very heavy fuel oil

The specifications which have been adopted by the association were compiled by the association's Committee on Uniform Oil Specifications with the aid and co-operation of the American Petroleum Institute and Committee D2 of the American Society for Testing Materials.

These designations are used by the Underwriters' Laboratories in specifying oils suitable for burners as listed by the Laboratories.

(*Continued on Data Sheet No. 48-I*)

OIL-FUEL SPECIFICATIONS OF THE A.O.B.A.

(*Continued from Data Sheet No. 48-H*)

Oil No. 1. Furnace Oil—Light

Scope.....1—This specification covers a light distillate oil for use in burners where a high grade fuel is required.

Properties....2—This oil shall conform to the following requirements: It shall be a hydrocarbon oil free from water, acid, grit and fibrous or other foreign matter likely to clog or injure the burner or valves.

(*a*) Flash Point:
Minimum—[1] Legal or (Pensky-Martens Closed Tester) ..... 110° F. or legal
Maximum—(Pensky-Martens Closed Tester).. 165° F.

(*b*) Water and Sediment, maximum..... 0.05%

(*c*) Pour Point, maximum..... 0° F.

(*d*) Distillation Test:
When 10% has been collected in the receiver the thermometer reading shall not exceed..... 420° F.
The end point shall not be higher than..... 600° F.

Methods of Testing[2]....3—The properties enumerated in these specifications shall be determined in accordance with the following methods of test of the American Society for Testing Materials, except as specified in paragraph (a).

(*a*) **Flash Point:**
[1] Minimum—the flash point, instrument and method for determining minimum flash point shall be that legal for the locality in which the oil is sold. In absence of legal requirements the minimum flash point shall be determined in accordance with the Standard Method of Test for Flash Point by means of the Pensky-Martens Closed Tester (Serial Designation D 93).
Maximum—Standard Method of Test for Flash Point by means of the Pensky-Martens Closed Tester (Serial designation D 93).

(*b*) Water and Sediment:
Standard Method of Test for Water and Sediment in Petroleum Products by Means of Centrifuge (Serial Designation D 96).

(*c*) **Pour Point:**
Tentative Method of Test for Pour Points of Petroleum Products (Serial Designation D 97-27 T).

(*d*) Distillation Test:
Standard Method of Test for Distillation of Gasoline, Naphtha, Kerosene, and similar Petroleum Products (Serial Designation D 86).

[2] In event changes are made in the Methods of Tests by the A. S. T. M. the current Methods of Testing is to be used rather than those mentioned in the specifications.

(*Continued on Data Sheet No. 48-J*)

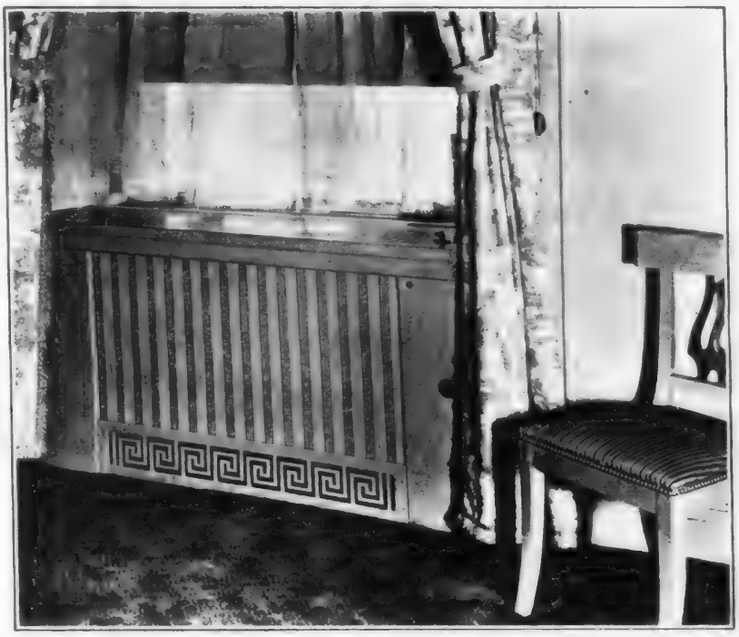
Development of the "Fantom" Radiator

DETAILS now available of the development of the American "Fantom" radiator, which has been placed on the market by the American Radiator Company, form an interesting story of the practical application of research in the manufacturing field.

The idea for this design was based on the fact that the heating effect of a radiator is not always the same, but depends on its position and upon many variables. Another factor that came in for consideration was the usual condition, in a radiator-heated room, of a higher air temperature at the ceiling than at the floor level.

Also, it was realized that in the average interior the heat loss may be largely a function of the surface of a window or group of windows. This fact gains added significance when it is considered that, in recent years, wall surfaces have become relatively smaller, while window areas have been increased.

It was accepted, as a fundamental fact, that radiators give greater satisfaction if they are located underneath, or very near, the surfaces of greatest cooling effect. As those surfaces usually are windows, the idea was developed of making the radiators and windows a unit whereby the radiator brackets would form an integral part of the window. This solution was worked out in co-operation with the Campbell Metal Window Corporation, of New York.



"Fantom" Radiator Designed to Emit High Proportion of Radiant Heat

One of the advantages of this arrangement is that the radiating surface does not occupy valuable floor space. However, care was taken to make the Fantom models sufficiently shallow so that, if not recessed, they would not protrude into the room to an appreciable extent. Another general idea worked out is the use of simple lines and designs that will permit their adaptation to any room architecture and at the same time be unobtrusive.

Carrying out the purpose of securing a design to obtain human comfort with minimum expense, the research followed this general order:

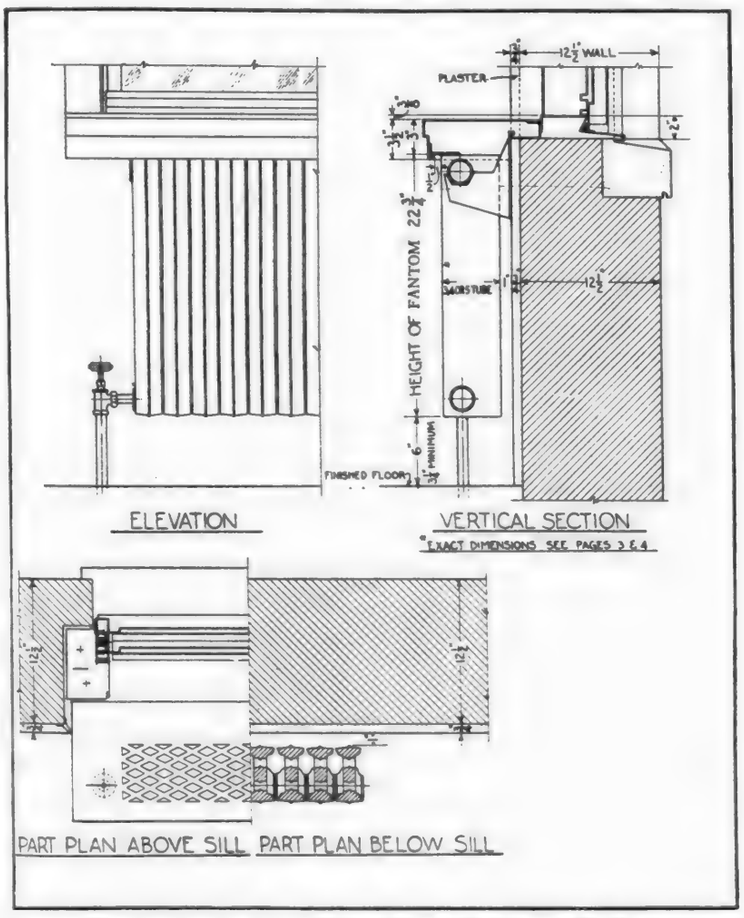
In the first place, it was considered that if a room is over-heated at the ceiling, heat is wasted, because:

1. In many cases rooms or spaces that are not to be heated, or only temporarily heated, are located above the room in question.

2. In any heated room natural ventilation is created. Warm air is dissipated from the upper part of the room into the atmosphere and cold air enters by infiltration through the windows and doors. Overheating at ceiling height increases the heat loss by natural ventilation.

3. With the room properly heated in the lower portion, lower room temperatures can be kept and yet comfortable conditions obtained.

Finally in view of the fact that a comfortable feeling calls for "warm feet and a cool head" (correct relative humidity being assumed), it is incorrect to consider eye height or breathing height the proper level at which to take the temperature. It was felt that a more suitable plane was between the stomach and the floor, or say, knee height, that is, about 18-in. from the floor. It did not seem advisable to consider the tempera-



Construction and Installation Details, "Fantom" Radiator

ture at any lower point than this because such temperature would be influenced by the character of the floor, floor lining, or rugs.

In working out the design of the Fantom radiator, the condensation was not taken as an indication of the comfort obtained. As a matter of fact, for house-heating purposes, it was taken as a premise that the sole purpose of a radiator is to procure comfort and not to furnish a certain amount of iron, or heating surface, or condensation.

In the company's investigations use was made of the Peerless three column 38-in. radiator to furnish a datum line from which performance could be gauged. To carry out the test, two rooms of exactly the same character were built.* In one room was installed this conventional radiator and in the other a test radiator. By changing the number of sections of the test radiator until the temperatures, at a point 1.5 ft. from the floor and in the center of the room were equal, it was considered that the test radiator was then equal, in useful heat output, to the standard radiator. In both rooms the relative humidity was equal and about 40%, while the air motion was negligible.

Those radiators, which gave the same useful temperatures (or, expressed in B.T.U., the same useful heat output) as the standard, and at the same time maintained lower temperatures at the ceiling, with less steam consumption, were designated as radiators of increased efficiency, although they produced condensation at a lower rate.

On the other hand, radiators of lower efficiency were considered to be those which maintained the same temperature at knee height, produced higher temperatures near the ceiling and, therefore, showed greater steam consumption and condensation, equal to a higher fuel consumption. It was found that radiators with increased efficiency are those which are low and shallow, which are stretched out in length as far as possible and from which the percentage of emitted radiant heat to convected heat is higher than for the standard radiator.

Obviously, radiator enclosures decrease the ability of a radiator to emit useful radiant heat, absorbing radiant heat on their surfaces and causing it to be converted into heat of convection. For this reason a design was evolved that caused the radiator to form its own enclosure, obviating the necessity for, and expense of, conventional radiator enclosures.

Thatcher "Elite" Boiler

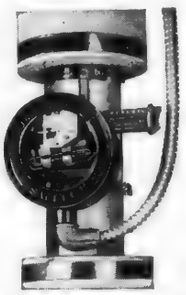
Under the trade name "Elite," the Thatcher Company, Newark, N. J., announces a new round heating boiler encased in a bright scarlet rectangular jacket. Features of design include an ash-pit and fire-box to accommodate oil as well as coal. The Elite is made in six sizes with ratings up to 1200 sq. ft. in steam or equivalent in hot water, or vapor heat.

*See Journal of A. S. H. V. E. for January, 1928, p. 55, and The Heating and Ventilating Magazine for February, 1928, p. 88.

New Apparatus and Appliances

Mercoid Risertherm

A controller of water temperature in heating systems and service water systems is announced by Mercoid Corp., 564 West Adams St., Chicago. This device is clamped on the risers of heating systems or on the surfaces of hot-water tanks or pipes and closely regulates the temperature of the water. The Risertherm is simple to install and easily adjusted. It can be fitted either to a horizontal or vertical pipe, the contacts not being affected by the change of position. An adjustable clamping device makes it possible to apply the control to the surface of large-diameter tanks by the use of extra length strips. As an example of the many installation possibilities, the Risertherm can be clamped to the riser of a unit heater, opening the circuit when the temperature in the coils drops to a predetermined point, insuring economical operation.



Risertherm—a Temperature Control Device Adapted to Either Horizontal or Vertical Application

Broomell Flow Fitting

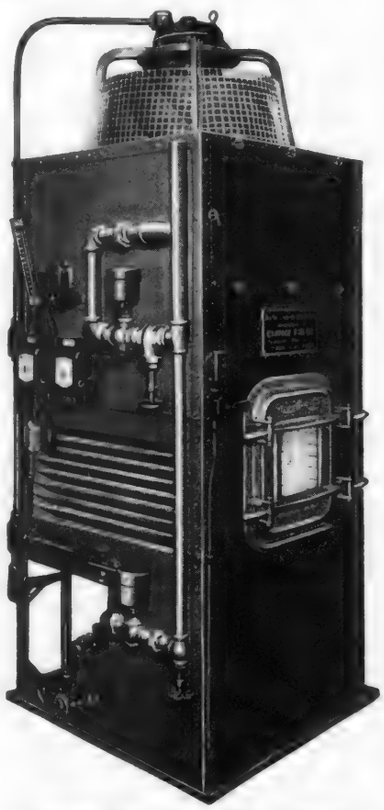
Designed to balance the circulation of water throughout a water heating system, a flow control fitting has been produced by the Vapor Heating Co., York, Pa., and will be marketed under the trade name of "Broomell." This device is designed to fit in the place of standard union elbows and provides a means of adjusting an orifice so that water flow to each radiator in a system can be suited to the requirements of each room.

The device also can be applied to domestic hot water or ice-water circulating systems. The Broomell flow control fitting is made in six sizes from ½ in. to 2 in., with the same roughing-in dimensions as standard union elbows of the same size.

Clarage Unit Humidifiers

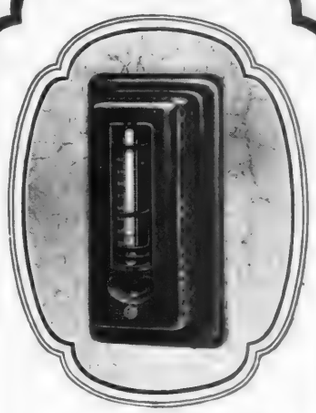
Refinement in manufacturing technique in many lines, has placed a demand on the designing ability of engineers in entirely different fields in order that the exacting requirements of modern processes can be met and automatically maintained. Typical instances may be cited in the case of the manufacture of paper and in the baking industry. Not many years ago time was not an essential element in either of these industries; at the present time, however, the demand for paper is so enormous, and the requirements for fresh bakery products are so exacting, that production has been increased to the highest possible degree; thus has been brought about the demand for equipment to maintain ideal atmospheric conditions in these plants.

Clarage unit humidifiers have been developed to supply properly conditioned air in industrial plants and are built in two types and eight sizes capable of handling from 1200 cu. ft. per minute to 5500 cu. ft. per minute. These humidifiers are designed to be installed, one in each room, or as a battery in large areas. Conditioned air is discharged from the top of the unit in all horizontal directions by a fan that has gone through a long process of development and refinement; it is of the centrifugal type, designed with a self-limiting horsepower characteristic, consequently it cannot overload and burn out the motor. Both types of humidifiers can, by proper connection to cold-water supply, be used as dehumidifiers, and cooling can be accomplished. These units are manufactured by the Clarage Fan Co., Kalamazoo, Mich.



Clarage Unit Humidifiers Handle 1200-5500 Cu. Ft. per Min.

MASSACHUSETTS MUTUAL LIFE INSURANCE CO.
SPRINGFIELD, MASS.
KIRKHAM & PARLETT, *Architects*, Springfield, Mass.
R. D. KIMBALL CO., *Engineers*, Boston, Mass.
WYCKOFF & LLOYD COMPANY,
Heating Contractors, Springfield, Mass.



The Powers Type D Thermostat

Does not need to be adjusted or overhauled annually. Often gives 15 to 20 years of accurate control without repairs of any kind. Gives true GRADUATED control. Uses only 10% of compressed air required by other thermostats. Costs more. It's worth more!

"The Best Costs Less in the End"

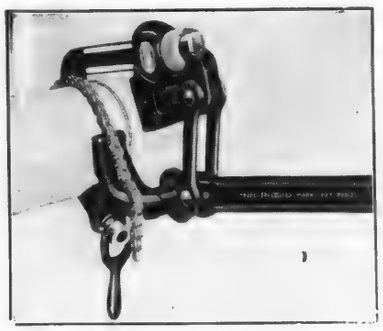
One of the show places of Springfield, Mass., is the large new building shown above. Upon entering it, one is impressed by its symmetry, excellence of design, solidity, and its rugged appearance of durability. Here is a building which will LAST.

Inside, the quality of the mechanical equipment is in keeping with the building itself. In selecting Powers Regulation to control the temperature in this building, the Architect and Engineer have provided their client with a system that gives 15 to 30 years of ACCURATE and DEPENDABLE control without the annual adjustments, repairs, and "SERVICE" bills which so often come with lower *first cost* systems of regulation.

THE POWERS REGULATOR COMPANY
35 Years of Specialization in Temperature Control
2718 Greenview Avenue, Chicago, Ill. Offices in 37 Cities

(4112)

POWERS



Ridgid Super-Six—a Wrench Especially Adapted to Breaking or Setting-Up Joints

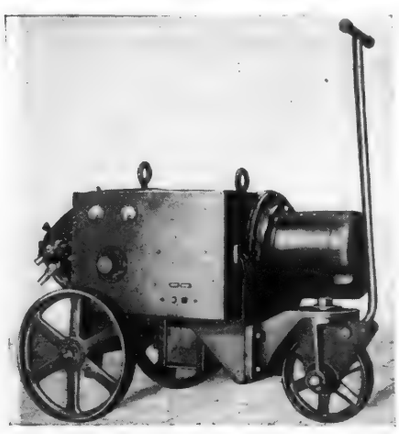
Pipe Wrench with Compound Leverage

Operation of a novel principle has produced a unique wrench designed especially to set up or to break pipe joints. The new Ridgid super-six, as announced by the Ridge Tool Co., Elyria, O., permits the multiplying of applied force in a ratio of nearly 50-1. In this application one portion of the tool, designed as a chain wrench, is set up on one of the elements to be disconnected. The other portion of the wrench, similar to a Stillson, grips the second member and the leverage is applied through the handle on the Stillson element turning about a pivot on the other section. It is stated that, in a recent test, this wrench broke a joint that had defied three men equipped with a conventional 48-in. wrench. Naturally, the benefit of the compound action is nullified when the wrench is used on a single pipe, as the operation of the principle requires that the two portions of the wrench be attached to a pipe and to an adjacent fitting having relative motion.

Westinghouse Single-Operator Welding Set

A 200-ampere welding set designed to meet requirements in the shop and field, and to be handled by a single operator, is announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Starting and stopping the unit is accomplished through the medium of a push button and a single rheostat varies the arc current over the entire welding range. Accurate adjustment is afforded by steps of 5 amperes between the limits of 60 and 300 amperes. The motor-generator and control equipment are assembled in an enclosed frame and the exciter is overhung from the motor end.

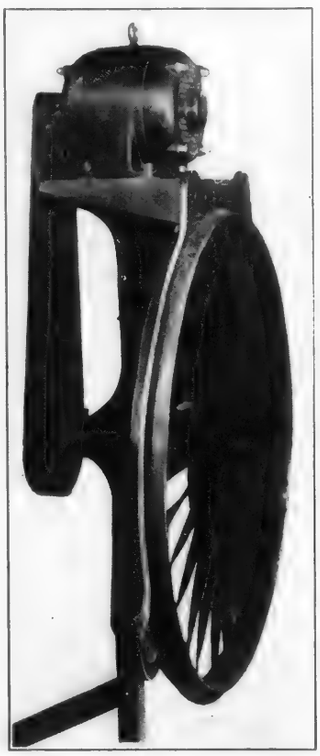
A steady welding current, insuring thorough penetration and fusion of the weld, is obtained from a constant current generator.



Westinghouse Portable Welding Set

New De Bothezat Pressure Fan

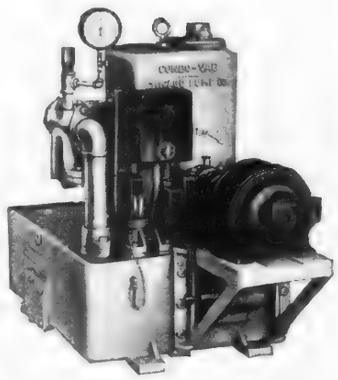
Announcement is made of a 42-in. diameter fan as an addition to the DeBothezat line, this unit being especially adapted for installations where positive static pressure is required. The fan is designed to deliver 16,000 cu. ft. per min. at 1-in. static pressure, with 5 H.P. Delivery at 1¼-in. static pressure is 12,000 cu. ft. per min. In this unit the fan is driven by silent chain from the motor which is mounted on the fan frame.



Silent Chain Drive Connects Motor and 42-In. DeBothezat Fan

"Condo-Vac"—A Vacuum Condensation Pump

Designed to maintain a definite and uniform vacuum in a heating system and automatically to feed the condensate back to the boiler as quickly as possible, a unit plant known as Condo-Vac has been developed by the Chicago Pump Co., 2300 Wolfram St., Chicago. This mechanism consists essentially of a combination receiver and base, a combination air and water pump, direct-driven by a fractional horse-power motor, and an automatic vacuum regulator and float switch. Condo-Vac is installed close to the boiler and is connected into the return line.



Condo-Vac Vacuum Pump

A feature of the design is the low inlet. For example, on the 8000 sq. ft. size the inlet is only 10 in. above the floor. This makes it unnecessary to excavate a pit for the pump.

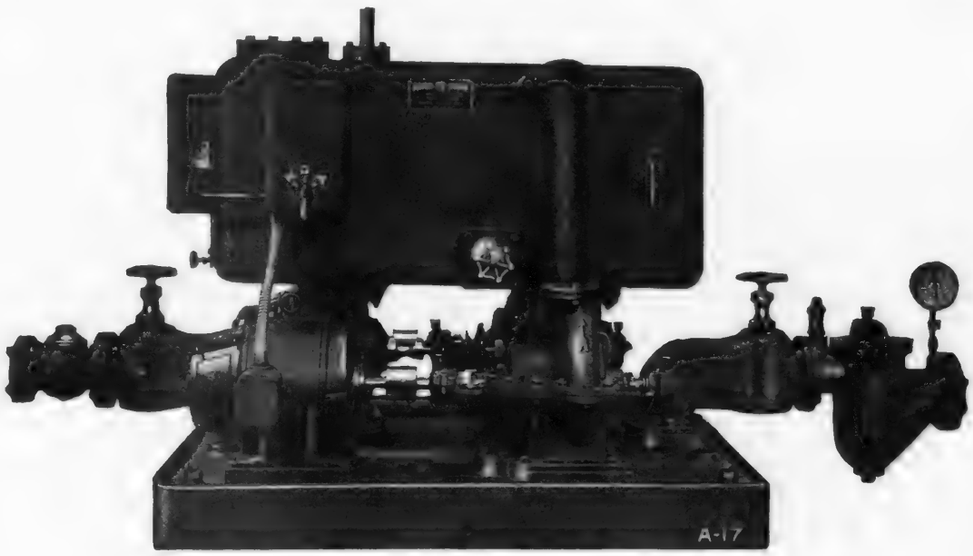
The pump has two impellers, one of which known as the vacuum impeller, draws the air and condensate from the receiver, exhausting the air to the atmosphere and delivering the condensate to the second, or water impeller, which discharges it to the boiler.

The operation of the equipment is as follows:

The vacuum impeller rotates about a port housing in which there are four ports. Two of these ports handle the water which is actuated by the impeller, and the other two ports draw the air and condensate from the receiver. The water and air is hurled from the impeller into the upper casing of the pump where centrifugal action of the mixture, flowing in a circular direction, separates the water from the air. The air is exhausted to the atmosphere and the water flows into the other half of the casing. Here it is picked up by the water impeller and discharged to the boiler.

The pump is operated automatically by a double control—a vacuum regulator and a float switch. Either the vacuum regulator or the float switch will start the pump—the vacuum regulator when the vacuum in the system and receiver is low; the float switch when the condensate in the receiver rises to a predetermined level. Both vacuum regulator and float switch must open to stop the pump. These switches are so arranged that the vacuum must be at its maximum and the receiver empty before the pump will stop. A cut-out switch is provided for the vacuum control. This allows the unit to operate as a condensation pump only during the night or at other times when no vacuum is desired on the system.

Condo-Vac units are available in five sizes, designed for attachment to boilers rated from 8000 sq. ft. to 65,000 sq. ft. of radiation.



The AMES Pump

A Forward Step in Heating Equipment of Interest to Every Heating Engineer

Every heating engineer will be interested in Bulletin No. 52-C7. Its illustrations and descriptive text fully explain the construction and operation of the Ames Vacuum Heating Pump. They make clear the methods by which greater efficiency has been achieved in combination with extreme simplicity.

Your absolute confidence in its performance is warranted by our ***three year guarantee.***

Send for Bulletin 52-C7

AMES PUMP COMPANY, Inc.
Division of STATEN ISLAND SHIPBUILDING CO.
90 West Street New York, N. Y.

DISTINCTIVELY DIFFERENT

New Trade Publications

HIGH-PRESSURE AEROFIN AND LOW-PRESSURE appear on the covers of two elaborate catalogs issued by the Aerofin Corp., 750 Freylinghuysen Ave., Newark, N. J. The former catalog is devoted to Aerofin units designed for pressures from 25 to 350 lbs.; the latter describes units for use in low-pressure heating systems. Both catalogs are examples of high-class technical literature, the illustrations showing all important details of design, construction and assembly, and the presentation of technical data leaving nothing to be desired. An example of how well such a subject can be presented, are the diagrams showing connections for Aerofin units. Seventeen diagrams show every possible combination of Aerofin units, and in each diagram the drip line is shown in green, the air line in purple and the steam supply in red. This delineation makes it possible to follow the piping with great ease. An interesting set of curves, occupying a large linen backed-sheet, is found in the back of the high-pressure Aerofin bulletin. This shows the temperature rise produced by a given number of rows of tubes, or a number of rows of tubes, required to produce any given temperature rise at different air velocities, and any difference between steam temperature and entering air temperature up to 440° F., with steam pressures from 25 lbs. to 350 lbs. gauge.

"100 AND 1 WAYS TO SAVE MONEY" is the title of an elaborate book prepared by Ingersoll-Rand Co., 11 Broadway, New York, embodying comparative cost data on the operation of portable air compressors and air-operated tools. It is the sixth edition of this publication. The information has been put together in handy-reference, cross-index form and, in nearly all cases, figures are presented on a man-hour basis so that they readily can be applied to local conditions. Ingersoll-Rand portable compressors have been developed to a high degree of perfection with heavy duty gasoline motors and direct-connected air compressors. This is one of the most comprehensive pieces of literature that has been prepared by any manufacturer of machine tools or similar equipment. Size 8½ in. x 11 in. Pp. 112.

DOES IT PAY TO INSTALL AN OIL BURNER? is the caption of an interesting booklet published by The H. B. Smith Co., Westfield, Mass. This booklet tells briefly of the remarkable growth of domestic oil burning, outlines the principles of boiler efficiency and graphically shows the difference between firing a boiler with coal and with oil. Information contained in the booklet, in regard to the methods that should be used to secure high efficiency from a coal-fired boiler when burning oil under it, is well worth reading.

UNIVERSAL UNIT HEATERS are featured in publication No. 209, issued by John J. Nesbitt, Inc., Holmesburg Junction, Philadelphia, Pa. In this elaborately illustrated booklet, photographs and drawings show the application of universal unit heaters to churches, large showrooms and stores, as well as to clubs and office buildings. Sufficient technical data are given to enable the architect or engineer to determine proper units for any given service.

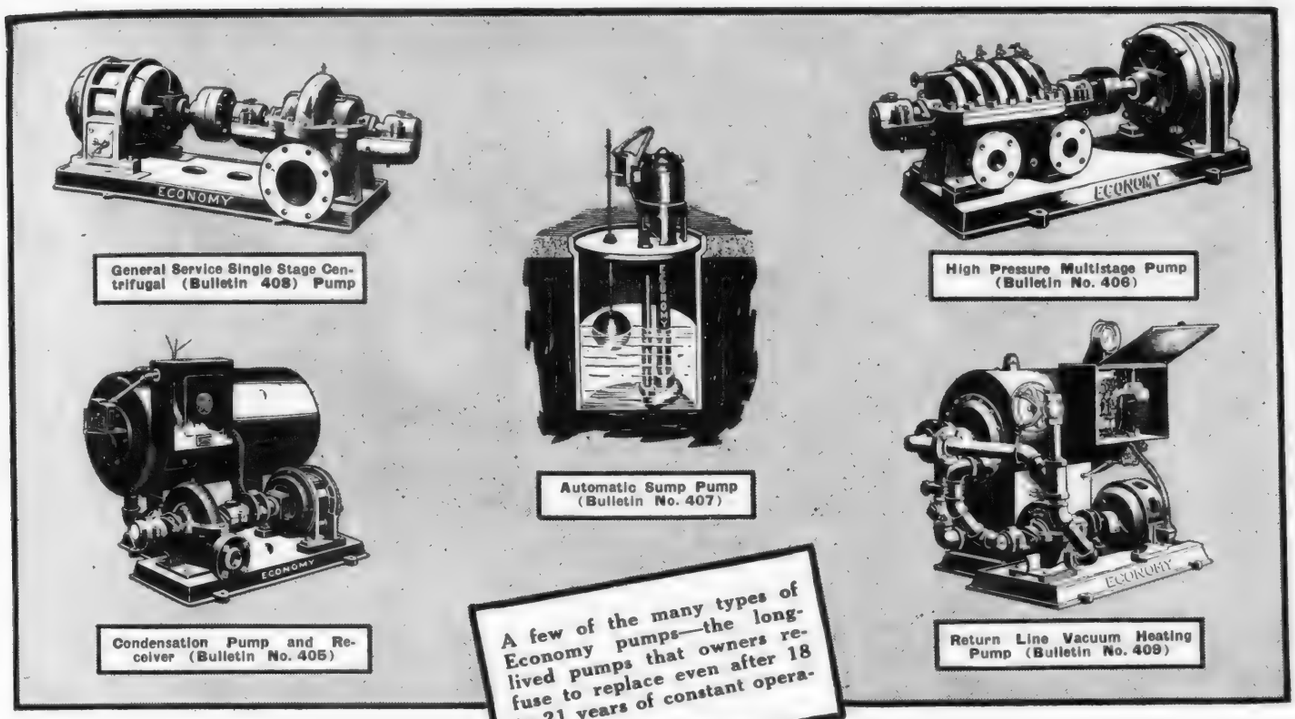
Opening a Pavement for District Heating Main Using Ingersoll-Rand Paving Breakers and Portable Compressor

Furniture Display Room Heated by Autovent Unit Heater Installed Behind Partition

AUTOVENT GUARANTEED UNIT HEATERS are described in Bulletin No. 80 issued by the Autovent Fan and Blower Co., 1805 No. Kostner Ave., Chicago. This bulletin deals with the design and construction and installation features of Autovent floor, wall and ceiling-type unit heaters. Attention is called to the fact that the design of the Autovent unit heater places the motor and fan behind the heating coil, keeping the motor out of the path of the heated air. Illustrations show typical installation of these units and capacity tables and dimensional tables furnish necessary data.

6 QUESTIONS YOU SHOULD ASK is the title of a circular issued by the Zephyr Washed Air Co., 120 South 9th St., Minneapolis, Minn. The circular features the replies to questions asked of a ventilating engineer, a lumber dealer, a furniture dealer, a rug manufacturer, a piano manufacturer and a doctor, in regard to the desirability of proper humidification in the home. The circular contains much information regarding maintaining proper atmospheric conditions, not only for the sake of health but for the preservation of household equipment.

SHAW-PERKINS HIGH-CONVECTION RADIATORS are described in catalog No. 25 issued by the Shaw-Perkins Mfg. Co., Oliver Bldg., Pittsburgh, Pa. In these radiators oval tubes, which constitute the major portion of the radiator, are arranged horizontally in two vertical rows and connected at both ends into vertical headers. The design produces a radiator that is narrow in width, of low height, and allows great flexibility in length; the radiators being made in single, one-piece, jointless units, as long as 14 ft. They can be supplied for either wall or floor installation. Heavy gauge, commercially pure iron is used throughout, the tubes being welded into the headers. The net weight is approximately 2 lbs. per square foot of radiation and this light weight, coupled with the small volume occupied, adapts the radiator to all conventional and many unusual methods of installation.


General Service Single Stage Centrifugal (Bulletin 408) Pump
Automatic Sump Pump (Bulletin No. 407)
High Pressure Multistage Pump (Bulletin No. 406)
Condensation Pump and Receiver (Bulletin No. 405)
Return Line Vacuum Heating Pump (Bulletin No. 409)
A few of the many types of Economy pumps—the long-lived pumps that owners refuse to replace even after 18 to 21 years of constant operation.

The Right Pump for Each Job

Find It In This Complete Line

There is a distinct advantage in using one make of pump for all water handling problems. Responsibility for performance is centralized. Uniformity of design and interchangeability of spare parts are secured. Leading engineers recognize these advantages, and are specifying Economy Pumps extensively. Economy's twenty-one years' experience in building pumps of outstanding quality for all jobs assures authoritative counsel on individual pump problems—whether water supply, sewage disposal, boiler feeding, or heating—whether heavy mill service or light automatic duty.

Economy engineers will be glad to cooperate with you in obtaining correct capacities. Send for bulletin describing the pump that suits your needs.

Economy Pumping Machinery Company
3431 West 48th Place, Chicago
Representatives in Principal Cities—Telephone & address under Economy Pumping Machinery Co.

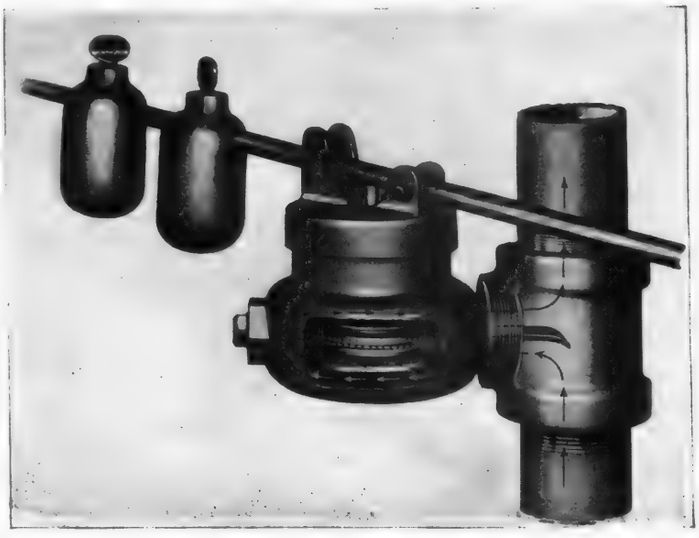
Economy Pumps

RACINE HEATING BOILERS are described in a catalog issued by the Freeman Mfg. Co., Racine, Wis. These boilers are electric arc welded and conform to the A.S.M.E. construction and material requirements. They are horizontal tubular boilers of special design to secure rapid water circulation and are sold equipped for any oil burner desired by the purchaser. There is ample combustion volume, large water capacity and generous steam space. The design and construction are such that the boilers are easily installed and readily cleaned. They are built in 24 different sizes covering a large range of the heating requirements, and are shipped as complete units, requiring no brick work.

U. S. OZONE appears on the cover of a catalog prepared by the United States Ozone Co., Chicago. This exceptionally well-prepared piece of literature tells of the application of ozone to the purification of water. Photographically, and in regard to the text matter, this subject is well handled and constitutes a little treatise on the subject of water purification through the use of ozone.

REFERENCE DATA ON EXPANSION IN PIPE LINES is the subject of bulletin No. 201, issued by the American District Steam Co., North Tonawanda, N. Y. This book is designed to supply a quick and convenient method for engineers and users of pipe lines to compute the amount of expansion due to varying temperatures. This information is in tabulated form, so worked out that it requires but a moment's calculation to arrive at the information desired. Following a presentation of these data Adsco expansion devices are illustrated, described and dimensioned. Size 8½ in. x 11 in. Pp. 32.

THERMODINE CABINET HEATER is described and illustrated in Catalogue 327 issued by the Modine Mfg. Company, Racine, Wis. This unit is composed of an extended-service heating element of copper tubes and fins, with bronze header tanks, enclosed in a steel cabinet with suitable grille and finished to correspond with decorations of the room in which it is to be installed. Indicating the attention given to detail in the design of this unit, it may be said that the cabinet is entirely free of any connection to the heating section below, and can easily be removed from the heating section, permitting the floor around the cabinet and the heating element to be thoroughly cleaned. Naturally, with this construction, a great deal of radiation equivalent can be installed in a small space. Each cabinet is provided with a water pan extending the full width of the cabinet and so arranged that there is a slight circulation of air over the surface of the water. The pan is easily filled by sliding the cabinet top forward. The humidifier is readily detachable for cleaning.



Rico Damper Regulator

RICO EQUIPMENT FOR HOT WATER HEATING is featured in a circular issued by The Richards Co., Pittsburgh, Pa. Adapted to any make of water heating installation, Rico equipment consists of a simple relief valve, which provides against excess pressure in the system, an expansion tank of ample capacity and a forced circulating damper regulator, which provides a positive and sensitive control of the draft door and check damper, insuring a uniform and accurate predetermined room temperature. The damper regulator is screwed into a tee in the flow pipe, in which position a deflector projects practically to the middle of the pipe and deflects a portion of the water through the device. The temperature of this water acts upon a bellows and causes movement in an arm actuating the damper. This equipment is shipped complete in unit cartons ready for installation.

CORRECT HEATING OF BUILDINGS is the title of a brochure published by Webster Tallmadge & Co., Inc., 30 Church St., New York. In it is featured the method of heating-system control, developed by this organization, by which radiation is zoned and automatically controlled. It is stated that material saving can be effected by utilizing this method of control, in which the steam supplied to the system automatically is proportioned to the outdoor climatic conditions.

THE PREVENTIVE AND THE CURE FOR "SICK" HOT WATER SYSTEMS is the title of a little folder issued by the Janette Manufacturing Co., 556 West Monroe St., Chicago, describing the hydrolator. This device consists of a motor-driven impeller, to be inserted in the return of a hot-water system where it is either automatically or manually controlled to stimulate the flow of water.

A Cabinet Heater That Harmonizes with the Decorations and Furnishings of a Home

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In last month's issue, on Page 120, in connection with the description of the new catalog of the Gradon Mfg. Co., of Philadelphia, the caption under the cut should have read "Gradon Single-Expansion Joint" instead of "Gradon Double-Expansion Joint."

Here's one day's deposit!
Convincing evidence of HART success

No wonder dealers are changing to the Preferred-Hart line so fast. Here is an organization with a sympathetic understanding of dealer needs, with ideals of dealer co-operation never before thought of in this industry — an organization with a fair selling agreement written for the dealer; with discounts based on yearly sales and not on size of shipments; with sales support that really sells. Overloading is impossible. Hart dealers are going big and they are with the Hart to stay. The *deposit* checks in this picture prove this fact true.

Preferred HART
Junior

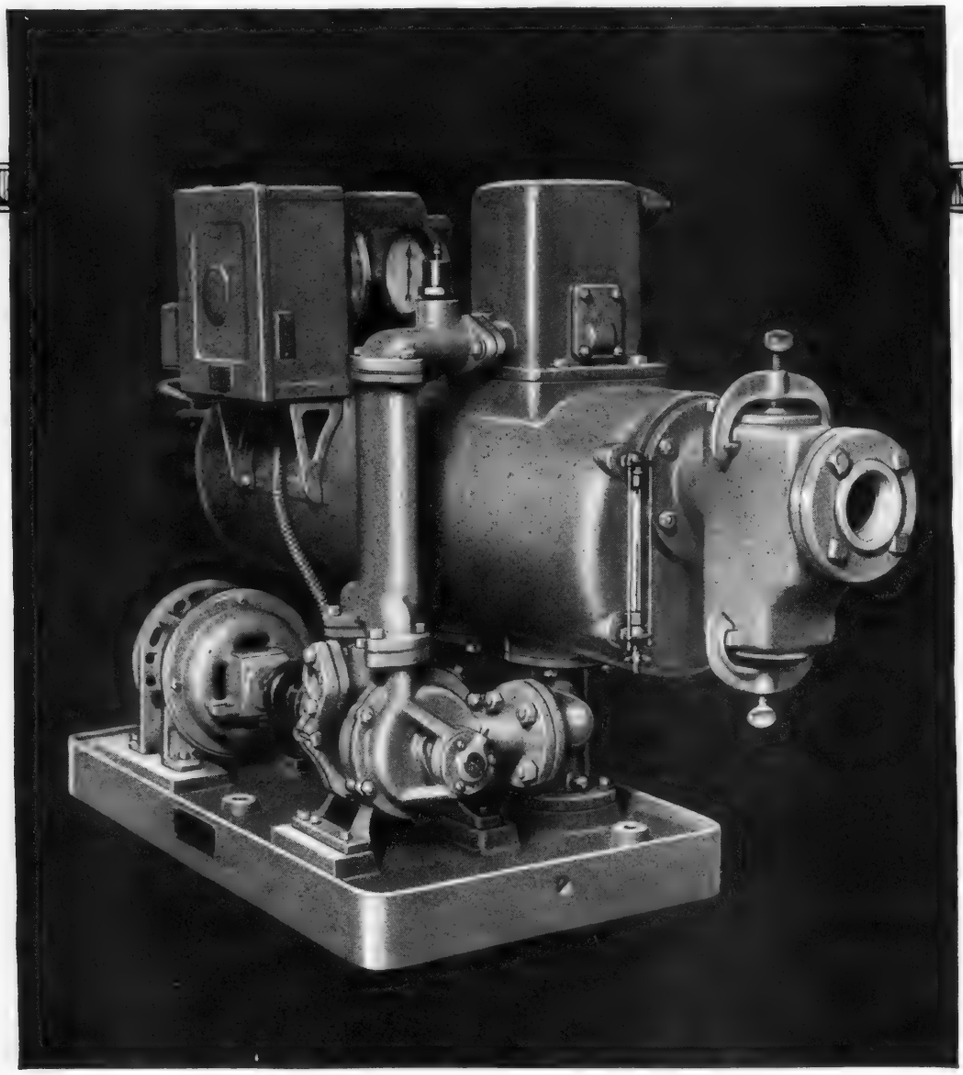
Low first cost model built especially for economical installation in small hot air furnaces. Economical, too, in operation—burns low grade fuel oil. Easy to install — needs no bricked in combustion chamber or elaborate changes in heating equipment. It opens the doors to hundreds of additional prospects that do not, and never will, exist for dealers who have only a one model line. Time tested, passed by Underwriters' Laboratories, this Preferred-Hart Junior matches in appearance, operation and fuel economy the larger Preferred-Harts that are going over so big with Hart dealers.

Here is another magnet that is drawing dealers here. Four models (Junior, D-1, D-2, D-3) make it possible for Hart dealers to meet every domestic and semi-industrial heating need, from cottage to public building, with the right size burner for every job.

The oil burner's greatest year is here. Preferred-Hart is going bigger than ever. Factory output has been increased to take care of many more good dealers who want this better line. Our ability to support more dealers is unlimited. If you are interested, write for facts that provide exclusive selling rights and more profits than you thought possible in the oil burner business.

Preferred Oil Burners, Inc.
Peoria, Illinois

HART OIL HEAT



Engineers endorse this pump

DURING the past twelve years, the Jennings Return Line Vacuum Steam Heating Pump has been specified by leading engineers for the heating systems of over 30,000 office buildings, apartments, hotels, schools and similar structures.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS ❦ CONDENSATION PUMPS ❦ COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES ❦ STANDARD AND SUCTION CENTRIFUGAL PUMPS ❦ HOUSE SERVICE PUMPS ❦ SEWAGE EJECTORS ❦ SUMP PUMPS ❦ FLAT BOX PUMPS ❦ MARINE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

Trade and Miscellaneous Notes

Coming Events

August 20-September 3, 1928. Regional meeting of the American Society of Mechanical Engineers at the Twin Cities, and a tour of the Great Lakes.

September 17-20, 1928. Second national meeting of the Fuels Division of the American Society of Mechanical Engineers in Cleveland, O.

October 8-12, 1928. Tenth annual convention of the American Gas Association in Atlantic City, N. J. Headquarters at Young's Million Dollar Pier.

October 15-19, 1928. Fifty-seventh annual meeting of the American Public Health Association in Chicago, Ill. Headquarters at the Hotel Stevens.

December 3-8, 1928. Seventh National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

January 28-31, 1929. Annual meeting of the American Society of Heating and Ventilating Engineers in Chicago, Ill. Headquarters at Edgewater Beach Hotel.

Miscellaneous Notes

May building operations, as reported by the F. W. Dodge Corporation, reached a maximum for the 37 States east of the Rocky Mountains. Figures amounted to $668,097,200 and showed an increase of 21% over May of last year. Analysis of this record indicates that 43% of all construction was for residential buildings, 22% for public works and utilities, 14% for commercial buildings, and 7% for educational projects.

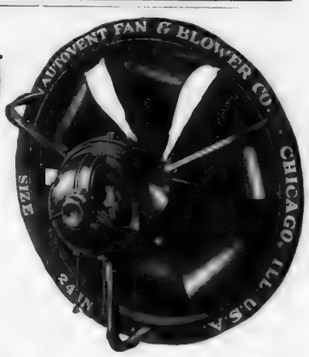
New York State and northern New Jersey reported contracts amounting to $184,555,100, which is the largest May ever recorded for this district, and the highest monthly total on record since December, 1926. This total showed a 22% gain over April and a 33% gain over May, 1927. In the New England States contracts amounted to $60,229,800, representing the largest monthly total ever recorded in this territory. This was an increase of 30% over April of this year, and a gain of 45% over the total for May, 1927.

Construction records in the Middle Atlantic States show figures amounting to $76,937,300, the largest May contract total on record for this district. It was a 38% increase over May, 1927, but a decrease of 25% from the total for April of this year. In the Pittsburgh district, contracts amounted to $67,469,300, showing a decrease of 10% from total for April, and 14% from May of last year. The highest May on record was reported for the Central West, figures amounting to $192,868,300, showing a 27% increase over May, 1927, and 3% over April of this year.

Contracts in the Northwest amounted to $9,483,700, representing a 33% increase over the total for April, and a 10% increase over May, 1927. In the Southeastern States, figures reported amounted to $49,851,300, showing a decrease of 10% from the total for May, 1927, and a 10% decrease from April of this year. Texas contracts amounted to $26,702,400, representing the second largest May contract total on record for this state. It was a 24% increase over May of last year and 43% increase over April of this year.

William G. Christy, executive secretary of the Citizens' Smoke Abatement League, St. Louis, has resigned after serving in this capacity for the past two years. Mr. Christy formerly was superintendent of the St. Louis Boat and Engineering Company, and now is national secretary of the Fuels Division of the American Society of Mechanical Engineers. For the present, he will maintain his offices as a mechanical engineer in the Railway Exchange Building.

AUTOVENT VENTILATION



No. 2—
IN INDUSTRIAL PLANTS

This is one of a series of advertisements showing the principal applications of Autovent Fans.

The illustration shows Autovent fans installed in an industrial plant, where proper ventilation is such an important factor in keeping up production.

Autovent Fans are supplied as a complete unit and are covered by a rigid guarantee. They can be relied upon to properly fulfill any duty for which we recommend them.

THE industrial field is daily finding increased need of Autovent Fans to ventilate various departments or for use in connection with a manufacturing process. Frequently installations are made in paint spraying booths, enameling and pickling rooms, blasting rooms and in speeding up drying processes.

Freely circulating steam, excessive heat, vapors and acid fumes not only decrease labor efficiency, but are a constant source of expense, breaking down costly motors, machinery, elevators and belting. This expense is eliminated by efficient ventilation.

Autovent Fans assure ideal working conditions, and the increasing demand offers convincing evidence of the correctness of materials and engineering principles employed.

Our staff of engineers is always ready to advise you on all ventilating and heating problems—without obligation.

Autovent service includes the manufacture of Autovent Propeller Fans, "Uniblade" Blowers and Exhausters and Autovent Unit Heaters—a complete, well-built line.

REGISTERED AUTOVENT. TRADE MARK

SEE OUR CATALOGUE IN SWEETS

Before specifying your next fans, investigate Autovent Products.

Autovent Fan & Blower Co., 1805-1827 No. Kostner Ave. CHICAGO, ILL.

The Fourth Midwestern Engineering and Power Exposition will be held in Chicago, February 12-16, 1929. A new policy has been established so as to have biennial instead of annual shows, to cover a period of five years, with a show in 1929, 1931 and 1933.

Clarence M. Woolley, chairman of the board of directors of the American Radiator Co., New York, was the speaker at the 109th commencement exercises at Colgate University, Hamilton, N. Y., June 11.

National Pipe and Supplies Association held its nineteenth annual convention at the Hotel Statler, Detroit, May 21-23, with 500 members and guests present.

Officers re-elected were: President, W. C. Hanson, E. G. Schafer Co.; first vice-president, C. F. Harvey, A. Harvey's Sons' Mfg. Co.; second vice-president, J. H. Borton, Hajoca Corp. Directors: M. M. Cochran, Cochran-Sargent Co.; J. J. McArdle, Philadelphia, and Murray W. Sales, Detroit.

Newly-elected officers were: Treasurer, H. L. Andrews, Pittsburgh; secretary, R. K. Hanson, formerly of Cleveland.

Harry P. Dempsey, 232 Delaware Ave., Buffalo, N. Y., announces that Howard S. Schall has become associated with him in the practice of consulting engineering. Mr. Schall formerly was connected with the Associated Buffalo Architects and the Chippewa Plumbing Company, and has had 20 years of engineering experience with the mechanical equipment of industrial plants and modern buildings.

M. J. Beirn, vice-president and general manager of sales for the American Radiator Co., New York, recently sailed for a tour of the Old World. After spending several months traveling around the country on a business trip, Mr. Beirn returned and arranged for this pleasure voyage.

World Engineering Congress, Tokio

Mechanical engineering will play an important part at the World Engineering Congress to be held in Tokio, Japan, in 1929, where a large delegation of American industrial engineers will assemble.

Subjects of scientific and industrial interests, covering every phase of engineering activity and development, are listed on the technical program. Heating and ventilation will be considered with papers on investigations of heat engines and boilers, hydraulic machinery, pneumatic machinery, machine tools and machines for manufacturing.

Dr. Elmer A. Sperry is chairman of the American committee of the Congress, with headquarters at 29 West 39th Street, New York.

Changes of Address

York Heating and Ventilating Corp., Philadelphia, Pa., has moved to the York Bldg., Sixteenth and Sansom Streets, which now houses the general offices and the Philadelphia district sales office of the company.

Arthur L. Stevens Corp., Chicago, has moved its office from 28 East Jackson St. to the Engineering Bldg., 205 West Wacker Drive.

Burnham Boiler Corp., Irvington, N. Y., announces the removal of its offices and showrooms to the Graybar Bldg., 420 Lexington Ave., New York.

H. B. Smith Co., Westfield, Mass., has moved its New York office from 10 East 39th St., to 10 East 41st St. John C. Faulkner is manager in charge.

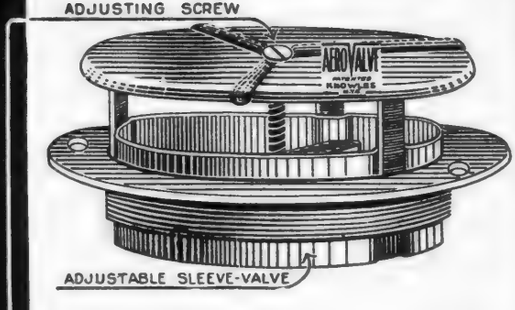
United States Radiator Corp., Detroit, Mich., has moved its general offices from 133 East Grand River to 1056 First National Bank Bldg., Detroit. Officers of the company are: President, Henry T. Cole; vice-presidents, E. E. McNair and J. F. McIntire; secretary and treasurer, W. E. Mosher.

Reading Iron Co., Reading, Pa., has moved its Buffalo office to 312 Jackson Bldg., 220 Delaware Ave., Buffalo. E. P. Hannig is district sales representative in charge.

John A. Lungstrum, Colorado district representative for Richmond Radiator products, O-E vapor-vacuum pressure heating systems, Ventura hot-water circulation fittings, has moved to Room 9, Keely Bldg., Denver, Colo.

Warren Webster & Co., Camden, N. J., announces the removal of its Boston office from the Penn Mutual Building to 76 Summer Street.

Knowles AERO VALVE



A simple turn of the screw gives the finest possible regulation

The IMPROVED Mushroom Air Diffuser

Easier to Regulate
Cheaper to Install
and Priced Right

An up-to-date mechanically correct Air Unit of fixed height; made of heavy rolled steel. Adapted to fulfill every requirement of Architect, Engineer and Contractor.
It combines the maximum of efficiency with the utmost convenience of adjustment by means of a hollow cylindrical sleeve-valve, which moves easily up and down in the air space by simply turning adjusting screw on top of cap. It affords the finest control of air delivery properly deflected from dome shaped cap and is free from obstructions and air pockets when used as an exhaust unit. Installation is simple and economical.
Provided with sleeve as a complete unit ready to install, or separately, with or without protecting steel sleeve ring. (See booklet for detail data.)

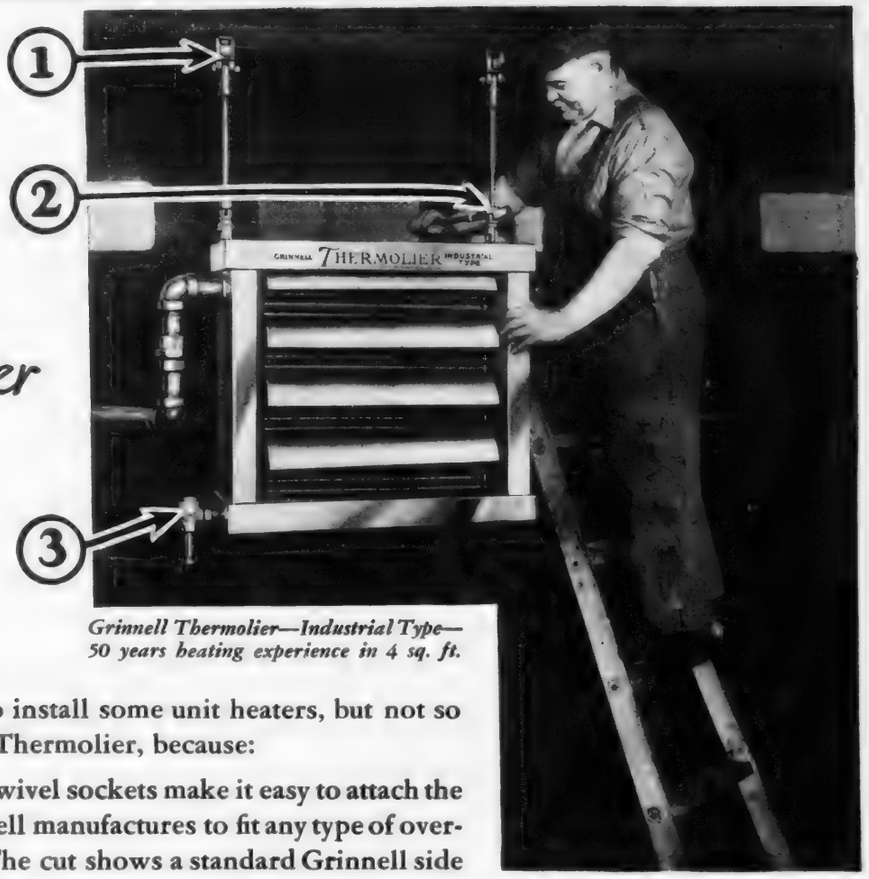
Knowles Mushroom Ventilator Co.
202 Franklin St., New York City

MADE BY THE MAKERS OF THE FAMOUS "NU-NOTCH" MUSHROOM AND "DISC-LOC" GALLERY RISER VENT

Jack: "Had no idea you could hook up one o' these things so quick."

Old Timer: "When you've been at this game as long as I have, you'll know anything Grinnell makes goes up easy and stays put."

The Old Timer Knows



Grinnell Thermolier—Industrial Type—50 years heating experience in 4 sq. ft.

IT'S a ticklish job to install some unit heaters, but not so with the Grinnell Thermolier, because:

[1] Its adjustable swivel sockets make it easy to attach the hangers which Grinnell manufactures to fit any type of overhead construction. (The cut shows a standard Grinnell side I-beam hanger.)

[2] A few turns of the wrench levels and adjusts the unit in correct position.

[3] The internal cooling leg permits one ¾ in. thermostatic valve to drain the unit perfectly without the usual outside cooling leg piping required with other unit heaters.

Yet these are only three of 14 features which make the Thermolier a better unit heater. A booklet describing its other features and telling why these heaters are displacing old-fashioned direct radiation systems is yours for the asking.

GRINNELL
PIPE FITTINGS

GRINNELL COMPANY

Executive Offices: Providence, R. I.

Branches in all Principal Cities

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name_____

Address_____

City_____

Sales Convention of Taco Heaters, Inc., held recently at the Providence-Biltmore Hotel and the Taco Factory, Providence, R. I., When the New Line of Taco Water Heaters Was Introduced to the Sales Force

New Firms

Eureka Supply Co., 167 Amsterdam Ave., New York, has been organized by Robert Kolz and John G. Kolz, the latter having been associated with Stroh and Wilson, and the Moylan Plumbing Supply Company. Robert Kolz, father of John, has been retired for many years. The new concern will have a complete line of heating and plumbing materials and accessories.

Bookhout & Law, Inc., 331 Madison Ave., New York, has been established to act as manufacturers' representatives. Officers of the company are: President, Raymond G. Bookhout, formerly in charge of the editorial department of the *Plumbers Trade Journal* and *Sanitary and Heating Engineering;* vice-president, John K. Law, who has been connected with manufacturers of toilet seats, and recently with the Blake Specialty Co., Rock Island, Ill. In addition to the Blake line, the company will handle the sale of water heaters made by G. & E. Co., La Porte, Ind.; also will represent the following companies in New York State, northern New Jersey and western Connecticut: Bell & Gossett Co., Chicago; Spencer Regulator Co., Salem, Mass.; Stop-Plug Co., Chicago; Forest Mfg. Co., Hickory, N. C.; Hall-Will, Inc., Erie, Pa.; Electro Flushing & Mfg. Co., West Allis, Wis., and the Never-Rust Co., Harrisburg, Pa.

Manufacturers' Notes

Modine Mfg. Co., Racine, Wis., announces the change in name of its complete line of heating equipment from Thermodine to Modine. This company also has appointed eight new representatives as follows: W. B. Irwin Co., 1020 Mercantile Bank Bldg., Dallas, Tex.; George W. Herlin, 401 North Santa Fe St., El Paso, Tex.; English & Lauer, 1224 South San Pedro St., Los Angeles, Calif.; Harry K. Mead, Board of Trade Bldg., Portland, Ore.; John B. Groseclose, 206 Builders Exchange Bldg., San Antonio, Tex.; E. H. Goins, 401 Sharon Bldg., San Francisco, Calif.; Crane Co., 307 West 2nd St. South, Salt Lake City, Utah; Howard H. Fielding, 1226 California St., Denver, Colo.

Kainer & Co., Chicago, Ill., has appointed H. Romeyn Smith, Inc., 12 Lispenard St., New York, as its representative.

Direct Control Valve Co., Chicago, Ill., has appointed Felix A. Gunther, formerly with the Allegheny County Steam Heating Company, representative in the Pittsburgh territory, with offices in the Diamond Bank Building.

Simplex Boiler Co., 403 Oliver Bldg., Pittsburgh, Pa., announces that G. G.

Tentacular Transmission Belt

on a Ventilating Fan
Large Paper Mill

ANOTHER SLACK TENTACULAR BELT

and no measurable slippage

Tentacular is unlike *any* belt ever used in construction and results. If interested in eliminating slippage, loss of power, idler pulleys, it will be worth your while to test this belt.

Tentacular needs no special pulley—just the usual cast-iron or steel. Smooth Running and Noiseless.

ALEXANDER PHILADELPHIA

Alexander Brothers, Inc., **19 South Street, PHILADELPHIA, PA.**

Sole Makers of Tentacular Transmission Belting **Branches and Distributors in All Principal Cities.**

Built to be more than "quiet"

ENGINEERS and architects expressed a need for a unit ventilator that would be more than "quiet" in operation—a unit ventilator which they could install, confident that it would run so silently that the occupants of a schoolroom, church or office would be unable to detect its operation.

Sturtevant Engineers set out to build such a unit ventilator. In the Sturtevant Research Laboratories, where ventilating equipment has been evolved to meet the demand of the greatest projects in air engineering, the work was begun. Designs were made — revised — made again. Countless experiments were conducted. Special motors and fans were developed. Finally, the "Silent" Sturtevant Unit Ventilator was produced.

Many installations of the "Silent" Sturtevant have already been made which you can inspect. The nearest Sturtevant representative will gladly take you to a local installation where you can observe the "Silent" Sturtevant in operation. You will then know why it meets the most exacting requirements for quietness and efficiency. Bulletin 344-A explains the equipment in detail. Let us send you a copy.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Atlanta	Camden	Cleveland	Detroit	Los Angeles	New York	St. Louis
Birmingham	Charlotte	Dallas	Hartford	Minneapolis	Pittsburgh	San Francisco
Boston	Chicago	Denver	Indianapolis	Milwaukee	Portland	Seattle
Buffalo	Cincinnati		Kansas City		Rochester	Washington, D. C

Canadian Offices at: Toronto, Montreal and Galt, Ont. Also Agents in Principal Foreign Countries

Sturtevant REG. U.S. PAT. OFF. the Silent Unit Ventilator

O'Brien has become associated with the company to take charge of sales. Mr. O'Brien formerly was with the Philadelphia Company as boiler salesman in the industrial and domestic heating department.

Gorton Heating Corp., 96 Liberty St., New York, has appointed W. L. Ticer, heating engineer, 1707 Eye St., N.W., Washington, D. C., as sales representative for the Gorton single pipe vapor heating system in the District of Columbia. Another appointment is that of R. J. Kingsbury, Inc., Devon, Conn., to handle sales in the Connecticut territory.

Weil Pump Co., Chicago, has appointed the following representatives: Allen Engineering Sales Co., Boston, Mass.; Bennett Sales Co., Shreveport, La.; Continental Sales Co., Minneapolis, Minn.; Charles Keuhrold, Milwaukee, Wis.; John B. Ketcham, Pumps, Inc., New York City.

Joseph Harrington Co., Harvey, Ill., announces that A. B. Benson, formerly secretary and treasurer of the Conveyors Corporation of America, has been appointed general manager of the company, to take charge of the stoker business. His appointment will relieve Mr. Harrington of this work, enabling him to devote more of his time to the strictly engineering features of the business.

Evins F. Glore & Son, Inc., Long Island City, N. Y., has been appointed by the Shaw-Perkins Mfg. Co., Pittsburgh, as distributors in the New York metropolitan district, including eastern New Jersey and southern Connecticut, for the sale of Shaw-Perkins high convection radiators.

Chicago Pump Co., Chicago, has broken ground for a second addition to its factory which will add 15,000 sq. ft. to the present manufacturing space of 35,000 sq. ft. This section will be of the Monitor type to accommodate overhead cranes.

Hajoca Corp., Philadelphia, Pa., at a recent meeting elected the following officers and directors: Chairman of the board, J. Harvey Borton; president. William A. Brecht; vice-presidents, George M. Bridgman, J. M. Denney, Franck C. Eckfeldt and Charles A. White; treasurer, Frank W. Dows; assistant treasurer, John T. Brown, Jr.; general sales manager, George H. Wobensmith, and R. E. Saul, supervisor of southern branches. It was announced that Karl Legner had resigned as vice-president and director, and Charles A. Meund had been elected a director.

Lyon Metal Products, Inc., Aurora, Ill., has purchased the Lyon Metallic Mfg. Co., of Aurora, and the Durand Steel Locker Co., of Chicago Heights, Ill. The major plants and new units will be in Aurora and Chicago Heights, with additional assembly plants in Jersey City and Los Angeles. New officers and directors are: President, F. S. Waters; chairman of the board, H. A. Gardner; vice-presidents, Keith Spalding, Walter N. Vance and C. E. Gerberich; secretary, B. L. Waters; treasurer, W. B. Brown; directors: J. E. Bales, J. B. O'Connor and R. T. Waters.

Bayley Blower Co., Milwaukee, Wis., has appointed Harry W. Terry general sales manager of the company. Mr. Terry formerly was associated with Ray D. Lillibridge, Inc., of New York.

E. W. Carr, Inc., New Orleans, La., has appointed Eugene J. McGuirk to take charge of its engineering department. Mr. McGuirk also is president of the Automatic Heat Corp., Gulfport, Miss., dealers for Ray, Aetna and Nokol oil burners.

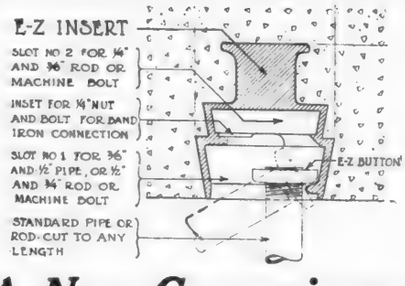
Timken-Detroit Oil Burner Co., Detroit, Mich., announces the appointment of Edward J. Duncan as manager of the metropolitan New York sales office, since the latter has been changed from an eastern branch to a city office. Eastern sales work, excluding sales in New York City, now will be handled by the main office organization. Mr. Duncan formerly was branch manager for the Timken-Detroit Company after its purchase of the Standard oil burner.

American Radiator Co., New York, announces the acquisition of the Locke Patten Works, Inc., of Detroit, and the Ypsilanti Motor Casting Co., Ypsilanti, Mich., which concern had been manufacturing castings for the company.

Bell & Gossett Co., Chicago, Ill., has appointed R. L. Deppmann Co., 511 West Canfield Ave., Detroit, as its representative to handle sales for the B & G indirect water heater.

E SIX IN ONE Z

CONCRETE INSERTS


E-Z INSERT
SLOT NO 2 FOR ¼" AND ⅜" ROD OR MACHINE BOLT
INSET FOR ¼" NUT AND BOLT FOR BAND IRON CONNECTION
SLOT NO 1 FOR ⅜" AND ½" PIPE, OR ½" AND ¾" ROD OR MACHINE BOLT
STANDARD PIPE OR ROD-CUT TO ANY LENGTH
E-Z BUTTON

A New Convenience!

Only one size needed for all pipe hangers. Ball and socket connection between insert and hanger. Fully adjustable — allows play to overcome expansion and inaccurate alignment of inserts. *E-Z Button turns in the insert—no couplings or turnbuckles needed.*

Write for Details and Prices

Healy-Ruff Co.
772 Hampden Ave., St. Paul, Minn.
Manufacturers of E-Z Radiator Hangers

TURTLEBACK
TRADE MARK

The Right Amount of Air

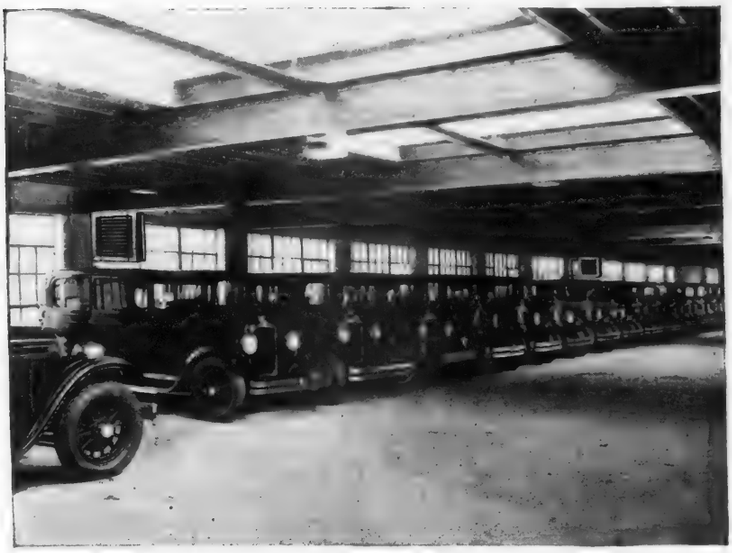
Just getting fresh air is one thing, but getting fresh air in a regular flow and proper quantity is another and much more difficult problem. A long and thorough study and thorough tests bring to you the Turtleback Air Diffuser, designed to admit air with greater velocity, maintaining a constant flow, without discomfort to those in the immediate vicinity.

The Turtleback is made of cast-iron, is unusually strong and is economical because it requires no replacements. Closely regulated and held in place by center screw. Easy to install and easy to regulate.

Write for illustrated catalog

VENTILATING PRODUCTS CO.
2800 Cottage Grove Ave., Chicago, Ill.

Better heating at less cost—clean, easily installed, flexible



When the Unit Heater is compared with other types of heating equipment, the enormous advantages of the former are evident. Lower first cost, lower installation cost, lower operating cost, better efficiency, much more flexibility, cleaner,—all these plus positive circulation of warmed air—these are some of the characteristics of Buffalo Breezo Fin Unit Heaters. Sturdy, compact construction and an unusually efficient fan unit are other features which add to their popularity.

"Heat with Unit Heaters"

Write for this new Booklet—
"Industrial Heating"

We now have a new book at the printer's which covers this subject in an interesting manner, explaining the advantages of various types and giving information as to the proper location of units.

Write for your copy Today.

Buffalo Forge Company

480 Broadway, Buffalo, N. Y.

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

1878 "Buffalo" 1928 — **"Air Engineers for Fifty Years"**

Laco Gas Burner Co., Griswold, Iowa, announces that, in addition to its new factory and office building now being constructed, another building 72 ft. by 100 ft. to be used for warehousing and shipping is in process. Plans are being made now for the erection of a foundry 72 ft. by 120 ft.

Crane Co., Chicago, is erecting an addition to its plant to house the test and engineering products departments of the company. This new building will be two stories in height, with a floor area of 80,000 sq. ft., and will cost about $400,000.

Allen Air Appliance Co., Inc., Glens Falls, N. Y., announces the election of F. C. Allen, Jr., as president of the company, with headquarters at the New York office in the Grand Central Terminal Building. Mr. Allen was the founder and former president of Allen & Billmyre Co., Inc., recently severing his connection with that organization.

Botfield Refractories Co., Swanson and Clymer Sts., Philadelphia, has appointed as its representative, the Builders & Industrial Supply Co., 4090 Detroit St., Toledo, O., for the distribution of Adamant fire brick cement, Adachrome and Adachrome fines and the Adamant gun.

Brown Instrument Co., Philadelphia, Pa., has larger quarters for its Pacific Coast branch at 420 South San Pedro St., Los Angeles, Calif., where S. F. Godfrey is manager.

Classified Advertising

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

FOR SALE CHEAP—Niagara Boiler No. 306—S-2000' and a Williams Oil-O-Matic Burner. Complete. Used one season, can be seen at Frank P. Bauer Marble Co., 4330 Melrose St., Chicago, Ill.

AUTOMATIC STOKER FOR HEATING BOILERS—Manufacturer wanted to take over the patents; build and sell a stoker designed for heating service. A stoker that has successfully been tested out, having low construction cost and developed by an experienced heating and stoker engineer. Address Box 71, care of Heating and Ventilating Magazine.

SALES ENGINEERS WANTED—An old established manufacturer of nationally advertised high-grade heating specialties has opening for sales engineers in the East, South and Central West. Preferably those acquainted with heating specialties, architects, jobbers and the trade. Splendid commission. Exclusive territory. Communications held strictly confidential. Address Box 72, care of Heating and Ventilating Magazine.

SALES REPRESENTATIVES WANTED—Old established company, manufacturing high-grade vapor heating specialties, has some territories open, particularly in the West and South. This is the easiest system to sell as it is the only true single-pipe vapor system with consequent saving in installation cost. Commission basis. Lay-outs not necessary. State territory and other lines handled. All communications held strictly confidential. Address Box 73, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representative on commission basis. Address Box 74, care of Heating and Ventilating Magazine.

MANUFACTURER'S AGENCY WANTED—Manufacturer of steam saving equipment and patented allied specialties, located in the East, requires agents in Virginia, North and South Carolina, and Central and Eastern Pennsylvania. This is a strictly commission project with exclusive sales rights for a qualified representative who maintains own office in each territory. Replies will be held confidential. Address Box 75, care of Heating and Ventilating Magazine.

CLIMB UPWARD TO SUCCESS THROUGH TECHNICAL TRAINING

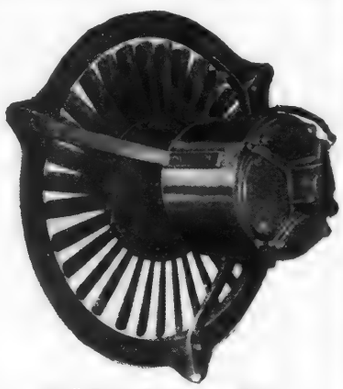
There is always room at the top for the technically trained man. For over 18 years, St. Louis Technical Institute has especially trained men for deserved promotion. An army of men have gained steady employment, higher salaries and more of the better things of life through our courses. You, too, achieve success through our engineering courses. Check the subject interested in, and send for full free information; no obligation.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

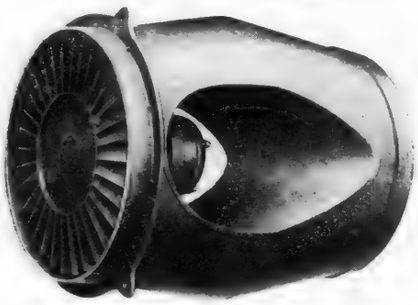
Saint Louis Technical Institute.
Est. 1910
The most thorough institution for Technical Home Study to-day.
4543 Clayton Avenue St. Louis, Mo.

42" Disc Pressure Fan
5 H.P. 850 R.P.M.
1¼" Static Pressure. Volume 12,000 C.F.M.

"Little Imp"
Residential Kitchen Fan



30" Disc Pressure Fan
2¼ H.P. 1140 R.P.M.
1" Static Pressure. Volume 6000 C.F.M.



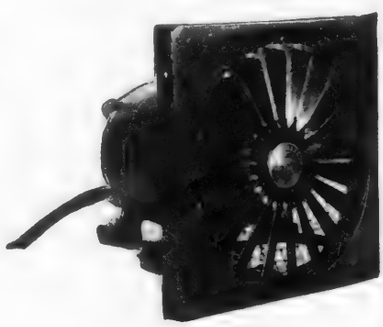
Bifurcator
For special ventilating jobs where fumes of excessive temperature or corrosive character are to be removed.

High Efficiency, Large Air Volume—together with High Static Pressure Characteristics—

are a few of several qualities which distinguish DeBothezat Disc Pressure Fans.

Power characteristics are such that overloading of motors is rendered impossible under any operating conditions.

DeBothezat Impeller Company, Inc.
1922 Park Avenue
New York City



Forced Draft
High Pressure Blower

HEAT where you want it, when you want it, with the VENTURAFIN

TRADE MARK REGISTERED

METHOD OF UNIT HEATING

Diagram of Action of the Venturafin Method in Heating a Room
Diagram of Action of Ordinary Methods in Heating the same Room
HOT
(WASTE HEAT)
WARM
COMFORTABLE WORKING CONDITIONS-FORCED HEAT/ EVEN DISTRIBUTION OF HEATED AIR
CHILLY
COLD

Heat does not have a tendency to pack at the ceiling.

Venturafin has the ability to heat up quickly.

No cold corners. No heat pockets.

Easy to install. Economical to operate.

More even distribution of heat. Better heat control.

Forces heat where you want it—when you want it and as much as you want.

Five times the efficiency of direct radiation.

One-quarter the weight of direct radiation.

The general tendency of heated air under normal conditions is to rise and pack at the ceiling.

To get this area comfortable with ordinary methods heat must literally be forced down from the ceiling.

To heat floor areas without excessive heat waste requires a method that forces heat as Venturafin does. Venturafin draws the cooler air from the floor—the warmer air drops to replace air drawn into unit and heated air is forced into circulation by Venturafin.

HEAT WITH UNIT HEATERS

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.
BRANCH OFFICES IN ALL PRINCIPAL CITIES

WRITE FOR CATALOG

(768)

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

Lighten the Engineering Burden on Your Air Cleaning and Conditioning Problems

Architects, Engineers, Contractors and Business Executives who have air cleaning and conditioning problems to work out, will find it both convenient and profitable to avail themselves of the capable co-operation we are manned and equipped to render.

For nowhere is there an organization that has a more thorough technical and practical knowledge of the science of air cleaning and conditioning. The working out of the hundreds of applications of all kinds, on which G.A.F. equipment is being used, has built up a store of experience that makes the solution of new problems a comparatively simple and speedy task.

Rendering our service still more valuable is an unusually complete testing equipment that gives our recommendations the authority of actual demonstration before installation.

The many points of advantage and service-proven excellence of G.A.F. equipment make it all the more desirable for Architects, Engineers, Contractors and Business Executives to lighten their engineering burdens by availing themselves of our advisory service which is offered without obligation.

Try this on your next air cleaning and conditioning problem.

The G. A. F. Automatic, Self-Cleaning Air Filter—Typical Large Unit

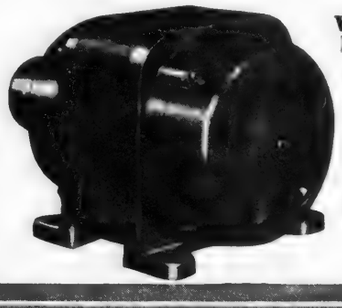
WRITE for a copy of the NEW CATALOG on the Automatic, Self-Cleaning Air Filter—The filter that eliminates the human element entirely.

General Air Filters Corp.
Division The W. B. Connor Co. Inc.
369A Lexington Ave., New York
Manufacturers of Air Cleaning and Conditioning Equipment, Air Filters, Air Washers, Spray Nozzles

✳ Cooperative Engineering Service ~

Exceptionally efficient application of advanced design and structural features in all types of electric motors up to 10 H.P. has resulted in world wide distribution of devices thus motored and noteworthy records on service requirements and operating costs.

BALDOR ELECTRIC COMPANY, 4356 DUNCAN AVE., ST. LOUIS, MO.



Write for Bulletin M27.

BALDOR
A BETTER MOTOR

Specialists in
STEAM ENGINEERING
Orifice Distribution
Electrical Control
Zoned Heating Systems
Industrial Heating Problems

Investigations Surveys | Special Designs | Reports Service

Webster Tallmadge & Co., Inc.
NEW YORK

GRADON MANUFACTURING COMPANY
Heat Exchange Equipment
Expansion Joints — Separators

ENGINEERED Gradon PRODUCTS TRADE MARK

Engineering Dept. Land Title Building
General Offices and Plant East Tioga and Memphis Sts.
PHILADELPHIA, U. S. A.

Certified Ratings!

Type ME Fans "deliver" exactly as shown in the capacity tables without increasing the speed of the fan or the size of the motor. The user is guaranteed definite results at low cost.

Write for Bulletin 100

NEW YORK BLOWER COMPANY

3151 Shields Avenue

Chicago, Illinois

Representatives in principal cities

SPRACO Filter Cell.

Air Filters

that clean properly because they are built on the right principle

Cleaning the air of dust, dirt and foreign matter is simple enough with the right equipment.

Spraco Air Filters do this most efficiently and economically because of the following reasons: The filter media provides the greatest possible dust collecting surface within a given space, and is arranged so as to change abruptly and continuously the small streams of air passing through it. It consists of a stack of expanded metal sheets arranged from coarse to fine in direction of air flow. It is made adhesive by dipping or charging the cell with a special solution called "Dustix." *Air cannot pass through this media without being effectively cleaned.*

The progressive arrangement of the media from coarse to fine mesh insures high cleaning efficiency with minimum obstruction to air flow.

The use of sectional framework is another important advantage of Spraco Air Filters. It eliminates air leakage, insures perfect alignment and greater strength and rigidity, and low cost of erection. Each section accommodates several cells and can be made to fit the space available. All metal construction.

Consult us about your air filtering, conditioning, washing and cooling problems. Ask for Bulletin F-81.

SPRAY ENGINEERING CO.

60 High Street, Boston, Mass.

Cooling Ponds
Spray Nozzles
Strainers
Park Sprinklers

Air Filters
Air Washers
Air Coolers
Flow Meters

ENGINEERS *and* MANUFACTURERS

TRADE MARK

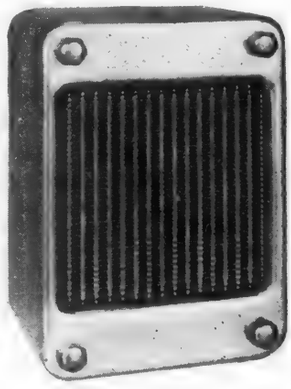
SPRACO BOSTON

Cable Address: "SPRACO," Boston; Western Union Code

McQUAY *Unit* HEATERS

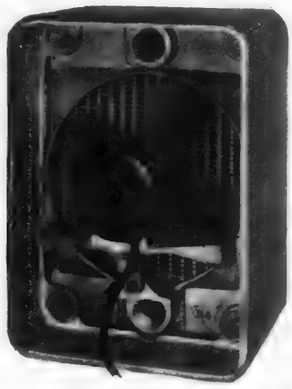
Embodying the distinctive time-tested McQuay features, here is a line of Unit Heaters which eliminates all the structural weaknesses of ordinary heaters.

The patented McQuay "Lock Seam" tubing ends the leakage hazard. Seam separations and blow-outs are unknown. The tubes are heavy brass, tinned inside, resisting rust and corrosion. The header plates are heavy copper—the tanks cast of special bronze alloy. The entire heater is practically indestructible.



The motor rests in a saddle supported by two steel arms. Between the supporting steel band which surrounds the motor, and the motor itself, is a quarter inch band of cork which absorbs all motor vibration *making the heater absolutely noiseless.*

Accessible and Simple



McQuay Unit Heaters are the simplest built—every part being readily accessible. In operation they are absolutely noiseless as they efficiently pour a steady stream of heated air to the parts of rooms where it is needed.

Each heater is subjected to 100 pounds steam or 200 pounds hydrostatic pressure—far more than any heaters are subjected to in ordinary use.

Sizes equivalent to 54 to 650 Sq. Ft. of Radiation

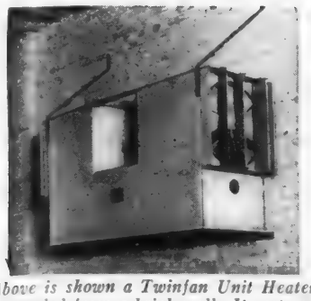
(Entering air at 70°)

Model A660-S	650 sq. ft.	Model B220-S	200 sq. ft.
Model A550-S	500 sq. ft.	Model C150-S	137 sq. ft.
Model B330-S	300 sq. ft.	Model C100-S	97 sq. ft.
	Model D80-S 54 sq. ft.		

Also: Cabinet Radiators and Concealed Radiators

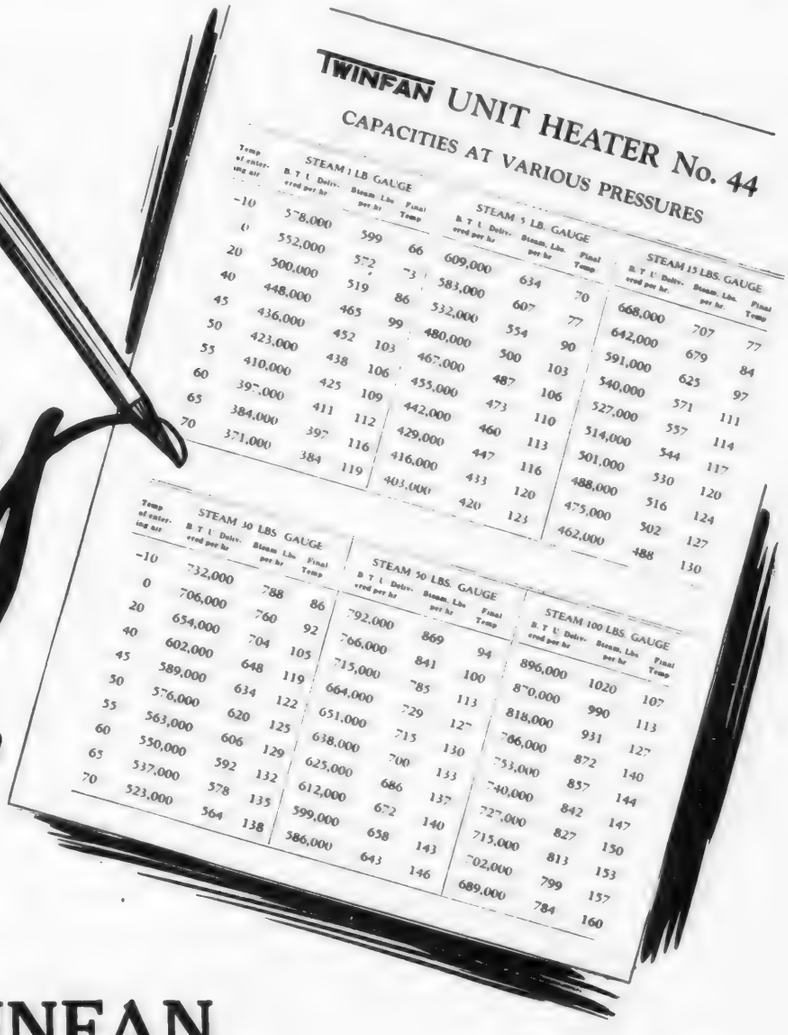
McQUAY RADIATOR CORPORATION

General Sales Office: Pure Oil Building, Chicago
Eastern Branch: 2148 Graybar Building, New York City
Branches in most principal cities



Above is shown a Twinfan Unit Heater suspended from a brick wall. It rests on an angle and the top corners are supported by strap hangers.

Easy to Figure



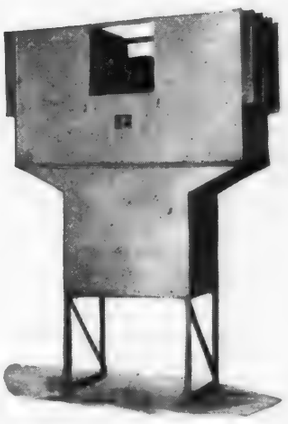
TWINFAN UNIT HEATER No. 44

CAPACITIES AT VARIOUS PRESSURES

Temp of entering air	STEAM 1 LB. GAUGE B. T. U. Delivered per hr	Steam Lbs. per hr	Final Temp	STEAM 5 LB. GAUGE B. T. U. Delivered per hr	Steam Lbs. per hr	Final Temp	STEAM 15 LBS. GAUGE B. T. U. Delivered per hr	Steam Lbs. per hr	Final Temp
-10	578,000	599	66	609,000	634	70	668,000	707	77
0	552,000	572	73	583,000	607	77	642,000	679	84
20	500,000	519	86	532,000	554	90	591,000	625	97
40	448,000	465	99	480,000	500	103	540,000	571	111
45	436,000	452	103	467,000	487	106	527,000	557	114
50	423,000	438	106	455,000	473	110	514,000	544	117
55	410,000	425	109	442,000	460	113	501,000	530	120
60	397,000	411	112	429,000	447	116	488,000	516	124
65	384,000	397	116	416,000	433	120	475,000	502	127
70	371,000	384	119	403,000	420	123	462,000	488	130

Temp of entering air	STEAM 30 LBS. GAUGE B. T. U. Delivered per hr	Steam Lbs. per hr	Final Temp	STEAM 50 LBS. GAUGE B. T. U. Delivered per hr	Steam Lbs. per hr	Final Temp	STEAM 100 LBS. GAUGE B. T. U. Delivered per hr	Steam Lbs. per hr	Final Temp
-10	732,000	788	86	792,000	869	94	896,000	1020	107
0	706,000	760	92	766,000	841	100	870,000	990	113
20	654,000	704	105	715,000	785	113	818,000	931	127
40	602,000	648	119	664,000	729	127	766,000	872	140
45	589,000	634	122	651,000	715	130	753,000	857	144
50	576,000	620	125	638,000	700	133	740,000	842	147
55	563,000	606	129	625,000	686	137	727,000	827	150
60	550,000	592	132	612,000	672	140	715,000	813	153
65	537,000	578	135	599,000	658	143	702,000	799	157
70	523,000	564	138	586,000	643	146	689,000	784	160

Heating Installation with the NEW TWINFAN CAPACITY TABLES



The heat unit output of the improved TWINFAN Unit Heater is a fixed and definite quantity; and we have made up capacity tables complete for steam from one to 100 lb. gauge, and for temperature of entering air from—10 deg. to 70 deg.

The capacities used on these Twinfan Unit Heater tables were determined by elaborate tests conducted in accordance with standards adopted by the Industrial Unit Heater Assns. and are fully guaranteed.

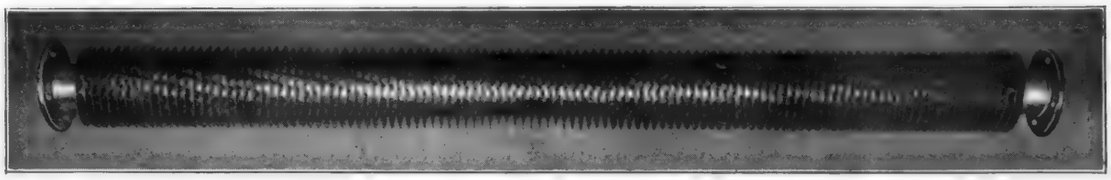
With these tables you can confidently lay out a heating installation, and install the necessary TWINFAN Unit Heaters, with the assurance that the building will be correctly and economically heated throughout.

These TWINFAN Heating Capacity Tables will be sent on request.

DWYER EQUIPMENT CO.

4534 W. NORTH AVE. CHICAGO, ILL.

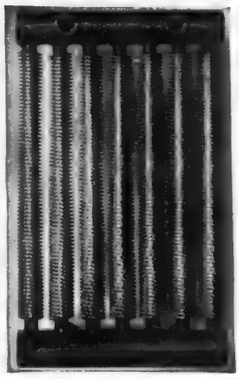
HEAT WITH WINFAN UNIT HEATERS



Specify RADIAFIN TUBES
for air-heating and air-cooling units

These tubes have 6 to 10 times as much surface as plain tubes of same size.

Units built with them have more surface and greater capacities with fewer tubes and fewer joints.

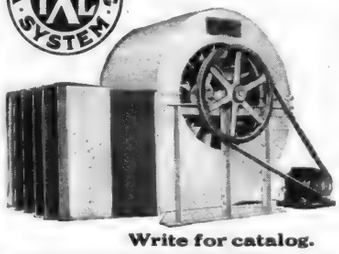


½" to 6".
Lengths up to 15 ft.
High or low pressure.
Plain or flanged ends.
With or without headers.
Quantity production.

Ask our Heat Transfer Dept. for additional details.

SCHUTTE & KŒRTING Co.
1153 Thompson Street PHILADELPHIA, PA.

Lakeside
VENTILATING IXL SYSTEM
Quiet *Electric Ventilator*

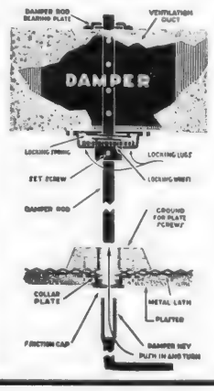


An electric ventilator that fills a long felt need—efficient and quiet in operation.

Easy to install—requires no tearing down of walls or ripping of floors.

Write for catalog.
LAKESIDE COMPANY, 107 Main St., Hermansville, Mich.

The ZENITH Self-locking DAMPER LOCK



Positively and automatically locks volume and splitter dampers in concealed ventilation ducts, in any position. No wing nuts, screws or devices loosened by vibration.

Concealed—Only one-inch plate, flush with plaster, shows.

Tamper-proof — Operated only with special socket wrench.

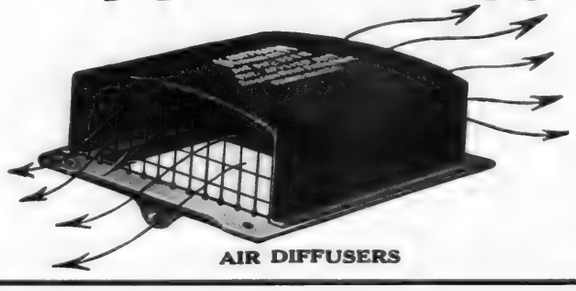
Economical—Inexpensive, easily installed, quickly adjusted.

A trial will demonstrate its value.

WRITE FOR LITERATURE

NORTHERN WEATHERSTRIP COMPANY
Duluth Minnesota

KAUFFMAN



AIR DIFFUSERS

SINCE 1908
Kauffman Air Diffusers
HAVE BEEN IN USE IN
Some of America's Finest Theatres
Simple to Install—Low in Price
Graduated Air Control

AMERICAN METAL PRODUCTS CORP.
ST. LOUIS, U. S. A.

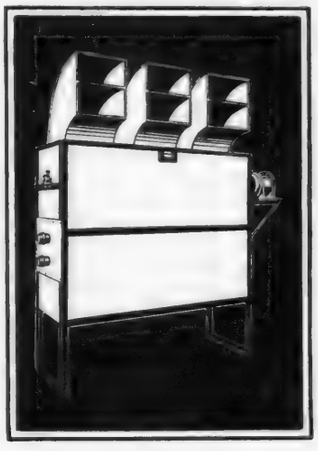
"HEAT WITH UNIT HEATERS"

If the wind blew Upward

BUT the wind doesn't blow upward. It blows horizontally—and covers a whole lot more territory in doing so.

This is Nature's way of following the line of least resistance. Similarly there are natural laws for the movement of heated air that must be respected if a building is to be heated economically. Nature offers more resistance to heated air forced downward and to cold air induced upward, than to either hot or cold air moved horizontally.

The success of York Heat-Diffusing Units in warming large and small factory areas evenly, quickly and at surprising savings in cost is because *the basic laws of heat-action* are the starting point in their operation.



Heated air is moved horizontally at high velocity, diffusing just above the heads of the workers. Return cool air travels very, very slowly at floor level to the floor-level intake.

Smoke bomb demonstrations (using smoke to make air currents visible) indicate the correctness of York Heat-Diffusing Unit operation. Temperature tests on installations prove it. Condensation tests on installations prove it. We back up results with a guarantee of performance.

For full particulars as to the best way to heat a building, address York Heating & Ventilating Corporation, 1539 Sansom St., Philadelphia, Pa.

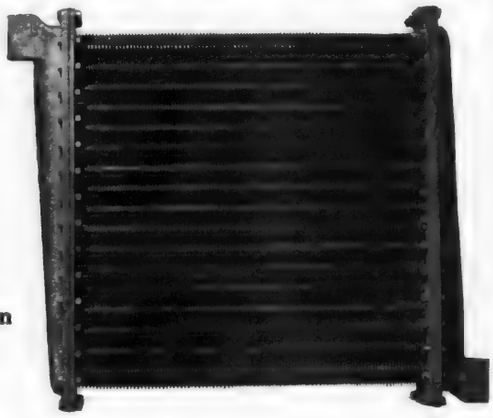
YORK Heat-Diffusing Unit

YORK HEAT-DIFFUSING UNIT *One of the Engineered Products made by* YORK HEAT-DIFFUSING UNIT

YORK HEATING & VENTILATING CORPORATION

Philadelphia

HELICALFIN



Seamless Copper Construction

EXTENDED SURFACE RADIATION

Meets the Demands of Modern Heating and Ventilating Progress

For Permanence and High Efficiency Specify

Rome Helicalfin Tubing

Helicalfin Heater Units and Radiators offer great advantages in high efficiency. The cores consist of tubes and headers made of copper and brass. They are sturdy, compact, light in weight, and last indefinitely with practically no corrosion.

Helicalfin Heater Units and Radiators are the ideal heating equipment for Homes, Schools, Institutions and Industrial Plants.

Rome Helicalfin Radiation has from five to nine times radiating surface of plain tube with proportionate increase in efficiency.

Engineering data covering the performance of Rome HELICALFIN Heaters has been prepared by a nationally known test engineer and is available upon request.

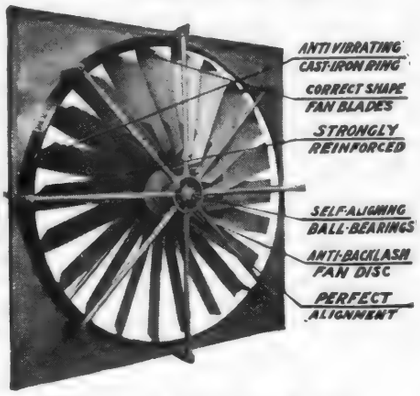
Makers of Good Radiators since 1905

ROME-TURNEY RADIATOR COMPANY

ROME, N. Y.

TYPHOON

Multiblade Disc Blower



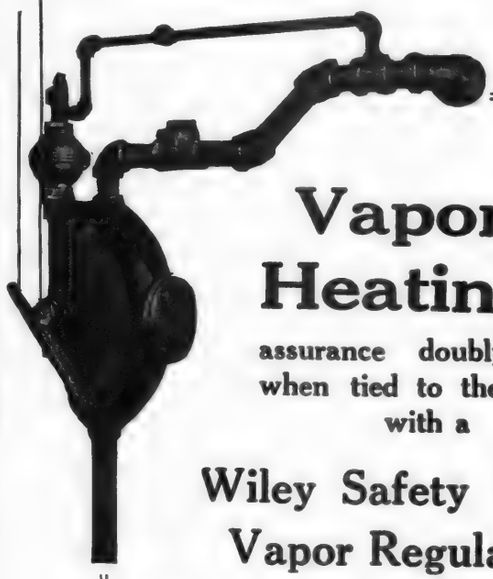
Disc Blowers
Centrifugal Blowers
Belt-driven Direct-connected
Unit Drive Fans
Unit Heaters
Ventilating Systems
Air Conditioning Systems

Typhoon Products and Typhoon Systems have been installed all over the country and all over the world. Typhoon is an international standard of efficiency for cooling, heating, and ventilating systems.

TYPHOON FAN COMPANY

345 West 39th Street
New York City

Dealers' and engineers' inquiries invited



Vapor Heating

assurance doubly sure when tied to the boiler with a

Wiley Safety Vent Vapor Regulator

Write for your copy of booklet describing the Wiley line of vapor heating specialties.

peerless quality product manufactured and sold exclusively by

The Simplex Heating Specialty Co.
(INC.)
Lynchburg, - Va.

Latest Improvements in Unit Heating and Ventilating

backed by 38 years of specialized experience

The Peerless Unit Ventilation Company was the pioneer manufacturer of Heating and Ventilating Units. Peerless Units built and installed *fifteen years ago* are still in service and giving perfect satisfaction. PeerVent improvements, therefore, are based upon practical experience.

And there are many improvements in the present day PeerVent machine. A remarkable new radiator, silent motor, simplified dampers, and other mechanical features. Improved methods of control—six standard combinations to choose from. Standardization of units, eliminating expensive special constructions.

Write for Booklet on the Unit System of Heating and Ventilating; or, on request, we will send our local representative.

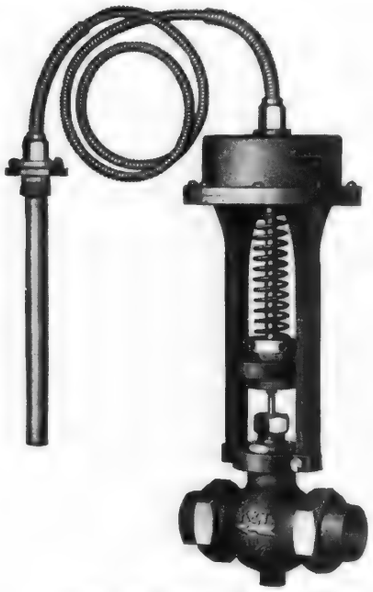
PEERLESS UNIT VENTILATION CO., Inc.

BRIDGEPORT, CONNECTICUT

NEW YORK, 369 Lexington Ave.; BOSTON, 80 Boylston St.; BUFFALO, 135 University Ave.; HARRISBURG, 705 Telegraph Bldg.; CLEVELAND, 1836 Euclid Ave.; DETROIT, 1214 Lafayette Bldg.; CHICAGO, 808 Monadnock Bldg.; MINNEAPOLIS, 240 Seventh Ave. So.; PORTLAND, ORE., 927 Board of Trade Bldg.; TORONTO, CANADA, Darling Bros., Ltd., 77 York St.

PEERVENT

HEATING AND VENTILATING UNITS



No. 49 Vapor Thermostat

Spring Types—No. 49 for controlling temperature of liquids and No. 491 for controlling temperature of air made in sizes ½" to 2½" incl. Bronze bodies in sizes 1½" and under, union connections. Iron bodies in sizes 2" and above, flanged ends.

Lever Types—No. 48 for controlling temperature of liquids made in sizes ½" to 8" incl., and No. 481 for controlling temperature of air made in sizes ½" to 6" incl. Bronze bodies in sizes 1½" and under, union connections. Iron bodies in sizes 2" and above, flanged ends.

Klipfel
Vapor Thermostats

For accurately controlling the temperature of liquids or air. Made Spring Type or Lever Type, as ordered.

May be adjusted by users to maintain any temperature within twenty degrees above or twenty degrees below the temperature for which the Thermostat is ordered.

A complete operating unit within itself—it is Self-Contained—All-Metal Construction. No compressed air, water, electrical or other auxiliary power required.

An increase in bulb temperature expands the bellows, which operates the valve stem and the bronze inner valve.

The All-Metal Bellows is the ultimate in sensitiveness and will move the steam controlling valve farther on a given temperature change than any vapor bellows of the same diameter and height.

Bulletin No. 127 contains good descriptions and illustrations covering our complete line of Vapor Thermostats. Write for your copy—today.

Endorsed by Thousands of Users

KLIPFEL MANUFACTURING CO.
2659 W. Harrison Street, Chicago, Illinois

CONTROL THE SPEED
OF YOUR VENTILATING EQUIPMENT!
REGULATE WARM AND COLD AIR VOLUME

WITH THE TIME TESTED

HORTON
VARIABLE SPEED
PULLEY

HORTON MANUFACTURING COMPANY
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THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 450° F.
Our No. 2600 metal for temperatures below 1500° F.
Other High Heat Metals for special uses.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
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Carrier
AIR CONDITIONING AND DRYING EQUIPMENT

See our detailed data in A. S. H. & V. E. Guide.

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Air Conditioning

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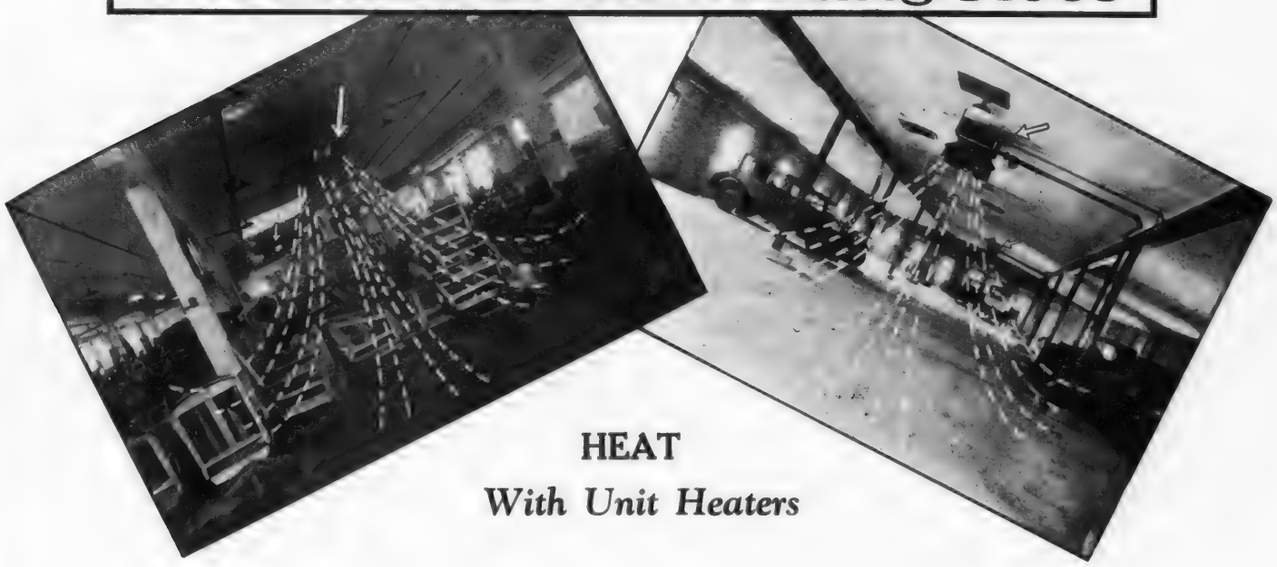
Literature on request. Write concerning your specific problem.

Wing Down-Flow Principle

Puts Heat at the Working Floor



HEAT
With Unit Heaters

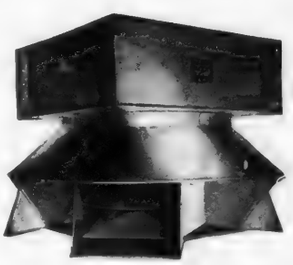
Wing Featherweight Unit Heaters

THE Wing Principle of Down-Flow Heating guarantees warmth at the working level, the place where comfort is desired. The Wing Method recognizes that in ordinary heating systems heat gathers under the roof. To overcome this heat accumulation, Wing Featherweight Unit Heaters are installed overhead. They withdraw the warm upper air, reheat it, and then deliver it uniformly through several outlets to the working level. In this way heat is put at the working floor where it is wanted, and overhead temperatures are reduced. Heat is more effectively utilized. The result is better heating at lower cost.

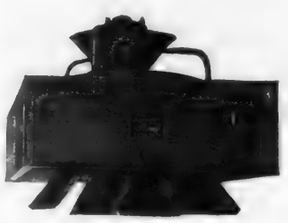
Write for Wing Heater Bulletin

L. J. Wing Mfg. Co.

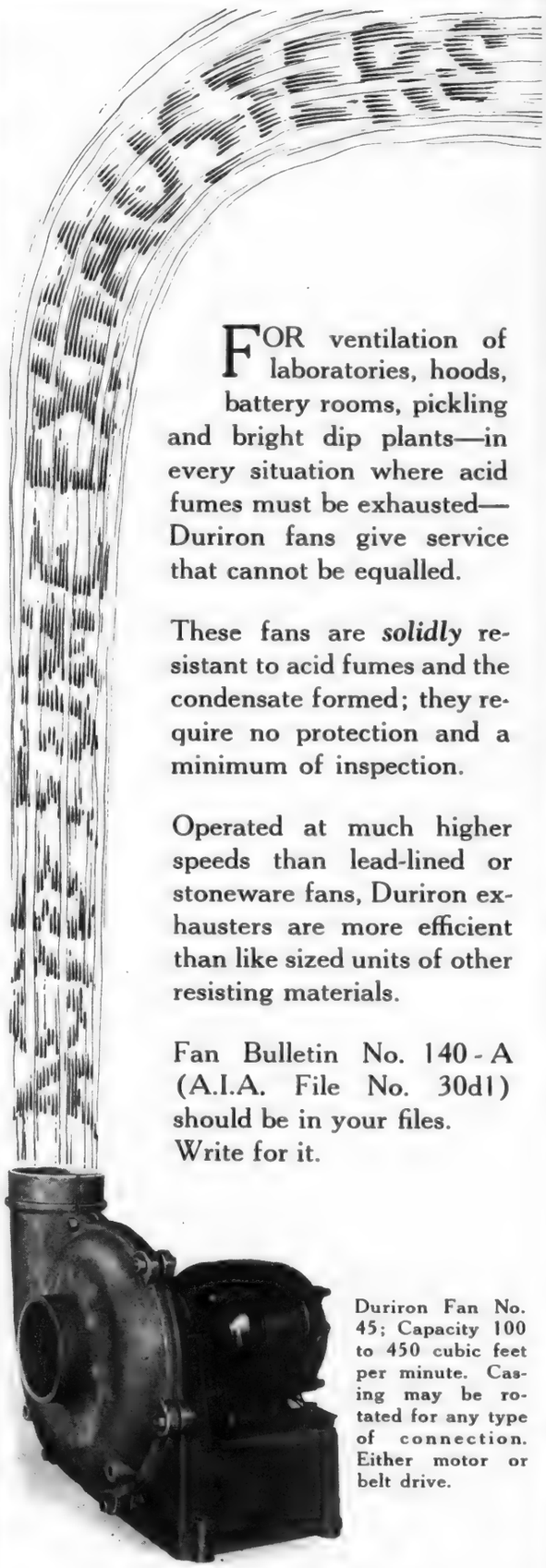
158 West 14th Street
New York, N. Y.



Wing Featherweight Unit Heater, low ceiling type. This type, made in several sizes, is installed in buildings and rooms in which the distance from floor to ceiling is about 12 to 16 feet.



High ceiling type, Wing Featherweight Unit Heater. Installed in shops, factories, and other buildings where the ceiling is at a considerable distance from the floor.



FOR ventilation of laboratories, hoods, battery rooms, pickling and bright dip plants—in every situation where acid fumes must be exhausted—Duriron fans give service that cannot be equalled.

These fans are *solidly* resistant to acid fumes and the condensate formed; they require no protection and a minimum of inspection.

Operated at much higher speeds than lead-lined or stoneware fans, Duriron exhausters are more efficient than like sized units of other resisting materials.

Fan Bulletin No. 140-A (A.I.A. File No. 30d1) should be in your files. Write for it.

Duriron Fan No. 45; Capacity 100 to 450 cubic feet per minute. Casing may be rotated for any type of connection. Either motor or belt drive.

Duriron is produced only by
The DURIRON COMPANY
DAYTON·OHIO

For Heating and Ventilating Use

Propeller Type Exhaust Fans

Big air removal capacity. Sturdy spot welded supporting ring. Powered with Emerson fully enclosed motor, specially designed for this work. Long life and quiet, vibrationless operation assured through use of finest materials and workmanship. Sizes 12-16-18-24-30-36 inches.

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RADIATOR BRACKETS

THREE STYLES
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We drop the "Ther"!

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Here's why

OVER six years ago we brought out the first successful suspension-type unit heater and copper radiation for commercial and domestic heating. This heating equipment has made so good a record that today we find a number of products so similar in name and appearance to ours that confusion is inevitable.

We accept this situation as part of the price of leadership — as an indication of the reputation Modine Products have earned. We are justly proud of the record of our heating equipment.

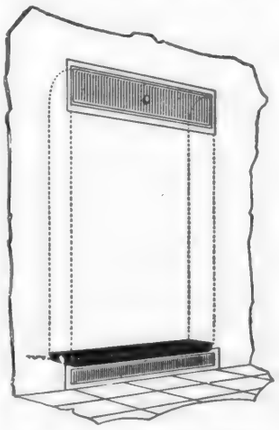
We feel that the public, the architect, the heating man should not, through possible mistake in name, be penalized by selecting other than genuine Modine Products — time-proved — successful.

Therefore, we change the name of our complete line from Thermodine to MODINE.

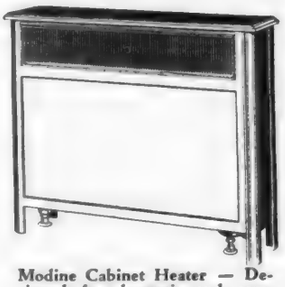
G. B. Modine
President

MODINE MANUFACTURING CO.
1707 Racine Street Racine, Wisconsin
Branch Offices in All Large Cities
London Office: 26-30 Artillery Lane

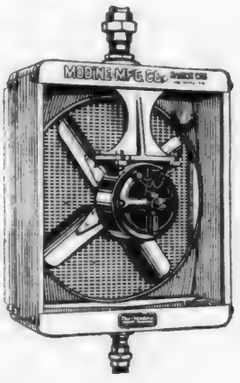
Modine Heating Equipment



Modine Concealed Heater —Designed for domestic and commercial heating. Modine heating section is installed *in the wall,* enclosed in a sheet metal stack varying from 20 to 50 inches high. Inlet at the floor for room air and outlet at the top of stack for heated air are concealed by grilles.

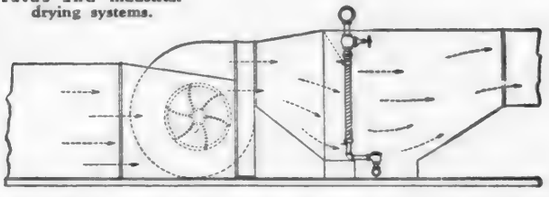


Modine Cabinet Heater — Designed for domestic and commercial heating. Consists of Modine heating section and attractive steel cabinet that can be decorated to harmonize with any room interior.



Modine Unit Heater — Designed for industrial heating and drying. One heater will replace approximately two tons of cast iron radiation.

Modine Blast Heater — Used in connection with ventilating apparatus and industrial drying systems.



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Traps
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You'll need this catalog to keep up to the minute on new ideas in steam fitting and vacuum heating.

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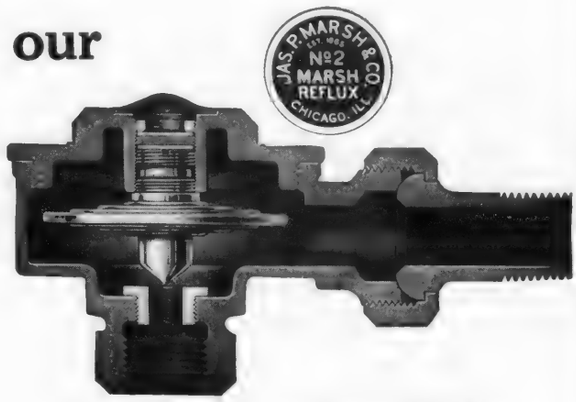
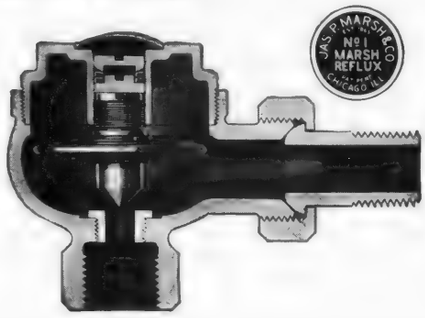


GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



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Established 1865 Over 60 years of dependable service.

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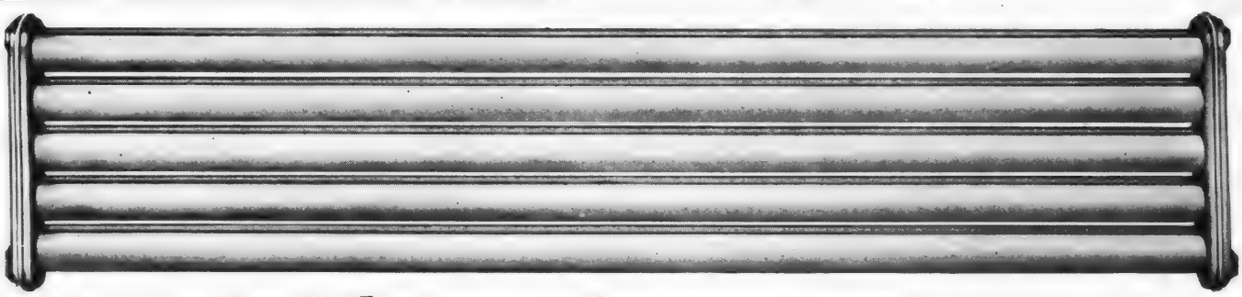
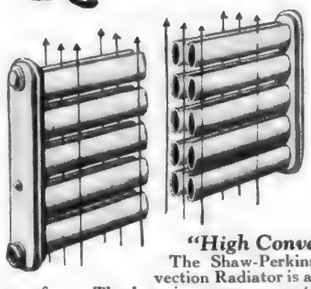


Shaw-Perkins

HIGH CONVECTION Radiators



"High Convection"

The Shaw-Perkins High Convection Radiator is all prime heating surface. The ingenious arrangement of the oval tubes allows the air to pass freely over the tubes, unimpeded by fins, baffles, or top and bottom hub connections, consequently the radiator has a high heat emission by convection.

Send for Catalog

Narrow One-Piece Radiators as Long as 14 Feet

Light in Weight: Shaw-Perkins High Convection Radiators are built in low, narrow one piece, jointless units, as long as 14 feet and weigh about one-third as much as other forms of direct radiation.

Heat and Cool Quickly: The light uniform walls cause them to respond promptly to the turn of the valve, giving quick and positive control over room temperatures.

Save Space: The radiators occupy about one-third less space than other forms of direct radiation. Brackets or legs can be supplied for either wall or floor installation.

Absolutely Sanitary: The radiators have no rough surfaces or fins to act as dust entanglements. All surfaces are smooth and easily accessible for hand wiping.

Unusually Adaptable: The light weight, the distinctive design and the unique dimensions of the radiators, make them suitable for installation in heating plants, upon walls, under windows, in recesses, upon columns, pilasters, etc. They are also particularly adapted to various drying and cooling purposes and to many industrial uses.

Get the Full Story of this Modern Radiator

SEND FOR CATALOG "H"

Shaw-Perkins Manufacturing Company

Pittsburgh, Pa.

Coxe Memorial Athletic Cage. Yale University, (330 feet by 159 feet), heated with only eight Skinner Units.

Heating a "Baseball Grounds" with Skinner work-area heating

No matter what type of building you are figuring on

investigate the Skinner Method. Skinner Unit Heaters keep the heat down where it is needed most—in the "work-area."

The operation of the Skinner Unit is based upon simple physical laws. A constant stream of heated air is blown out just above the heads of the workers. At the same time the cooling air at the floor level is drawn, by fan suction, into the heater and rewarmed. As it is thus pulled down to replace this lower air the heated layer becomes a great warming blanket over the entire room, heated air is blown to the farthest corner and circulated constantly in every section.

If you are designing the heating system for any kind of new building or for the replacement of an obsolete installation, Skinner sales-engineers can help you solve the problem effectively and "for good". Write them.

HV6

Can you imagine a building large enough to house a regulation "outdoor" baseball ground? And can you think of a harder place to heat?

The building shown above does enclose a baseball ground—and, even when the temperature drops below zero on the outside, baseball—regulation "outdoor" baseball—is played in the building, with complete comfort for players and spectators.

This mammoth job of heating is done with Skinner Unit Heaters—the heaters that keep the heat in the *work-area,* blow it to the farthest corner and constantly circulate it throughout the entire area. Only eight Skinner Units are needed to heat the Yale Athletic Cage.

No matter what size or shape building you are figuring on, Skinner heaters can heat it probably better than any other system you might employ. Why? Not simply because Skinner Brothers were the first to use the Unit Method; not simply because of their 35 years of accumulated heating experiences; but because of a *combination* of experience and leadership, *plus* a heating unit that has been proved in thousands of installations.

Skinner Heating has solved this heating problem "for good." There will be no need for replacement of any unit as Skinner Heaters are built to outlast the building.

Skinner Brothers *work-area* Heating

1470 S. Vandeventer, St. Louis, Mo. **New York Office, 1710 Flatiron Bldg.**

Factories at St. Louis, and Elizabeth, N. J. See phone book for branches in:

Washington Cleveland Buffalo Seattle Chicago Philadelphia
Kansas City Pittsburgh Detroit Baltimore Boston Cincinnati

Originators of the Unit Method of "Work-Area" Heating

GAUGE BOARDS

American Gauge Board in Hotel Schroeder, Milwaukee, Wisc.
Architects, Holabird & Roche, Chicago.
Heating Contractor, Paul E. Mueller, Milwaukee.

American Gauges, Recording Gauges, Dial Thermometers, Recording Thermometers and Clocks are furnished in the same case for uniformity of appearance, either for wall or flush mounting. They make ideal gauge board installations.

Write for the following Catalogs:

Gauge Catalog A-14,
Recording Gauge Catalog E-14,
Gauge Tester Catalog D-14,
Relief and Pop Valve Catalog V-14,
Thermometer Catalog F-14,
Dial Thermometer Catalog G-14,
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338 Berry St., Brooklyn, N. Y.
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Makers of American Industrial Instruments since 1851.

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Typical Convecto Bathroom Radiator Installation in the Savoy Plaza

Convecto was awarded the Building Investment Certificate of Merit for 1927.

CONVECTO BATH ROOM RADIATORS

"A really modern radiator built specially for the up-to-date bathroom." It takes up little space and may be placed on wall or behind fixture.

The Fins are mounted on tubing under a special patented process.

The Convecto is extremely light. No support other than connections necessary — reducing installation cost to the minimum.

The Convecto makes a really handsome installation.

METAL STAMPING CO.

Established 1872
13th to 14th Streets—East Ave., Long Island City, N. Y.
Makers of Artone Radiator Enclosures.

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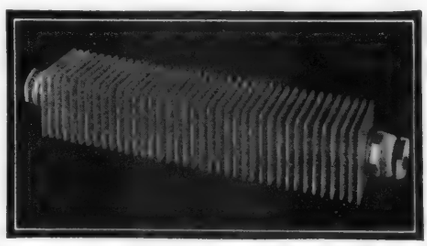

Made in 5 standard sizes. Furnished with or without well made removable Cover of Lattice Design—in white or colors to match bathroom.

New York Life Building, New York, N. Y. *Architects*: Cass Gilbert, Inc. *Builders*: Starrett Bros., Inc. *Constructing Engineers*: Meyer, Strong and Jones, Inc. *Electrical Engineers and Contractors*: Fishbach and Moore, Inc. *Heating Contractors*: Baker, Smith and Co.

Distributing one million cubic feet of air per minute — *for an army of workers!*

NOW taking its place among the finer monuments to modern architectural genius, the New York Life Building, massive and towering, dominates New York City's midtown skyline.

In this impressive structure, covering a large city block; burrowing underground to a depth of five basements and reaching thirty-four stories into the air; a veritable army of workers will be employed. To insure ideal working conditions and adequate, economical ventilation, Sturtevant equipment was specified for use in this huge building.

Fifty-six Sturtevant fans, comprising one of the most extensive installations in use today, will distribute more than one million cubic feet of air per minute and facilitate the flow of heat over a heating surface of thirty-five thousand square feet.

The selection of Sturtevant equipment and its installation from sub-cellar to tower guarantees the owners of the New York Life Building a uniform economy and dependability of operation on a scale in keeping with the magnitude of their enterprise.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

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Sturtevant

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HEATING-VENTILATING AND POWER PLANT EQUIPMENT

Owners' Coal Bills *Cut in Half!*

Wing Blowers Burn Low-Cost Coal

Fine apartment building in New York equipped with Wing Blowers in the heating boilers. Buckwheat coal at $6.50 a ton is burned. Coal consumption no more than when large expensive coal was burned. Installation simple; duct connects the blower discharge to rear of ashpit.

TO cut coal bills in half burn Buckwheat coal with a Wing Motor Blower. Buckwheat is small anthracite—just the same good quality as Stove or Nut coal, but costs only $7 to $8 a ton!

Wing Motor Blowers supply the necessary forced draft to burn small, low-cost Buckwheat coal. Thousands of Wing-equipped heating boilers are saving money and giving better heating.

Selling and installing Wing Blowers means a big profit-making field for you. Our 25 years in the heating business helps and backs you. Use the coupon below to get our Motor Blower Bulletin and full information.

L. J. Wing Mfg. Co.
158 West 14th St., New York, N. Y.

L. J. WING MFG. CO., 158 W. 14th St., New York, N. Y.
Please send, without obligation, the Wing Motor Blower Bulletin, and full details on how I can make money by installing Wing Blowers.

Name.....

Address.....

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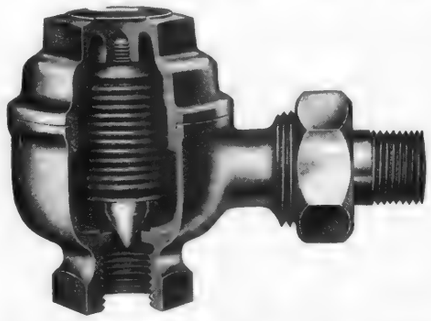
THE No. 3 THERMOFLEX-HYDRON ANGLE RADIATOR TRAP



The Hydron Bellows is the only **hydraulically formed proof-tested** bellows used in thermostatic radiator traps today. Each and every bellows is subjected to several hundred pounds, internal hydraulic pressure in the making. Weak, uneven, or defective metal **will not** make a Thermoflex-Hydron Bellows. Our new complete catalog No. 52 is now ready for delivery. Gladly mailed upon request.

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35 Hartford Street **Boston, Mass.**

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Incorporated

1326 Markley St., Norristown, Pa.

Announces the Opening of its New Laboratory

The opening week will occur in August when manufacturers, engineers and contractors engaged in the industry will be welcome.

Visitors after that date may arrange for an inspection upon appointment.

Watch for announcement of date in the TEST LOG.

UNIVENT and Glass—*make the difference*

HERE is the answer to what Heating and Ventilating Engineers have asked for, in the ventilation of schools, offices, banks, hospitals and similar buildings.

Simpler than opening windows—the Univent brings in fresh air from out of doors, filters it, warms it to a comfortable temperature, and gently distributes it to every corner of the room—with invigorating air motion, but without draft.

Bringing these advantages of perfect ventilation and health protection—the Univent has opened up a new avenue of sale and profit for the Heating and Ventilating Engineer and Contractor.

*Christodora House . . . *being equipped with*

UNIVENT (TRADE MARK)

VENTILATION

With thousands of successful installations in all parts of the country, and with nationwide endorsement by leaders in architecture, engineering, school and business administration—the Univent has developed a new standard of ventilation.

To learn what the Univent offers in economy, flexibility and ease of control, and how we can help you sell Univent ventilation—send the coupon below for our engineers' Univent catalogue.

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Henry C. Pelton, Architect
New York, N. Y.
Clyde R. Place, C. E.
New York, N. Y.

Manufactured only by THE HERMAN NELSON CORPORATION, *Moline, Ill.*

Builders of Successful Heating and Ventilating Equipment for Over 20 Years

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THE HERMAN NELSON CORPORATION
Moline, Illinois

Please send, without cost or obligation, your book No. 24 explaining Univent Ventilation.

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Address.....

City..... State.....

THERMO SYPHON TRAP

For All Types of

Steam Heating Systems

Don't wait until it is too late

"Too late" means a cracked section to be replaced, or possibly a new boiler. All trouble resulting from low water line can be avoided by the installation of a Thermo Syphon Trap, which returns all condensation to the boiler, maintaining the water line, regardless of pressure or vacuum. Has been approved by heating experts and used with great success on various prominent patented Vapor, Vacuum, Atmospheric and Modulation systems.

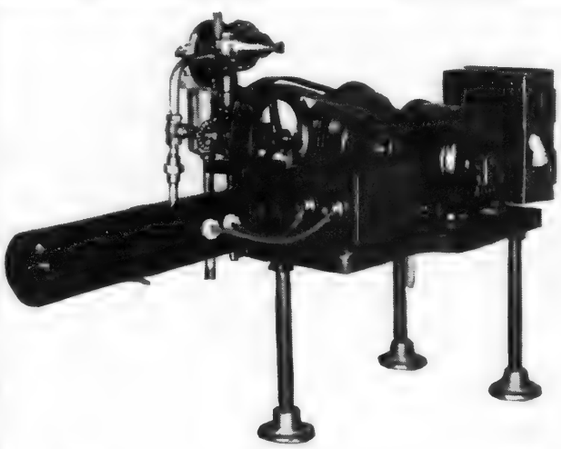
Not only does the Thermo Syphon Trap protect the boiler, but it assures proper circulation and noiseless operation. Prevents air-bound or water-logged conditions.

Don't wait until it is too late. Send for Bulletin No. 16-HV, giving full details.

LYTTON MANUFACTURING CORPORATION

FRANKLIN, VIRGINIA.

ALSO HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves.



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Century motor
Webster transformer
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Contactor controls
Nozzle, strainers
Diaphragm oil regulating valves and all other parts York built

Write for further details and sales plan

$395, completely installed with 275-gallon tank

A very low-priced, high-grade, mechanical atomizing burner.
Long discount from this price.
Electric ignition, extremely quiet operation.
Approved to burn 28 gravity oil.

York Automatic has become the leading burner in a number of cities.

Proof that our policy of building the finest burner possible to build, and then selling it to the trade for the lowest price possible, is the way to volume business and satisfactory profits for the distributor.

Nine years of building burners have permitted us to cut production costs, maintain quality, give sales and engineering assistance and still sell the York Automatic for little more than half the price of similar machines.

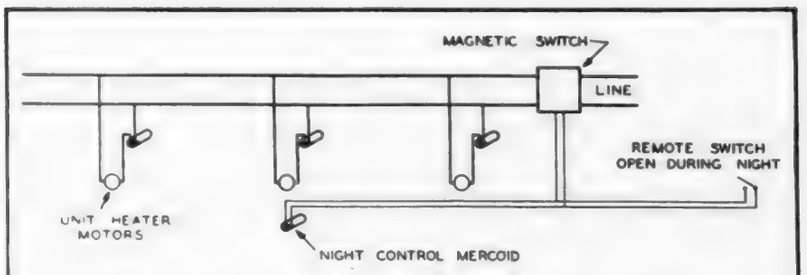
If you are at present selling burners, you need the York Automatic to round out your line of burners.

If not in the burner business, this gives you a splendid opportunity to make a connection with one of the fastest growing oil burner companies.

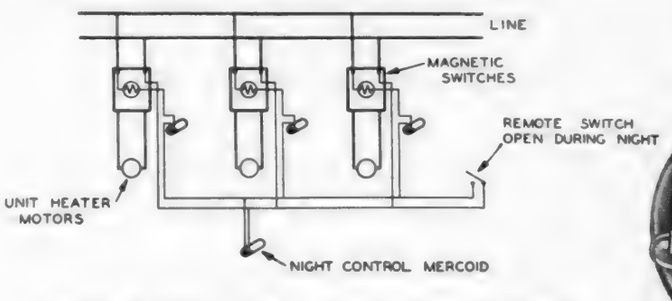
YORK OIL BURNER COMPANY, 21 WEST CLARK AVENUE YORK, PA.

THE wiring diagram shows how each Heater or group of Heaters can be controlled during working hours by an individual MERCOID Thermostat set to maintain the desired operating temperature. It also shows the hook-up for the single night control MERCOID Thermostat. The night control MERCOID, set for the desired lower temperature centrally and properly located in the room is connected to a circuit running to the engineer's office. At closing time he simply throws a hand switch which places the low temperature night MERCOID in control of *all* the Unit Heaters.

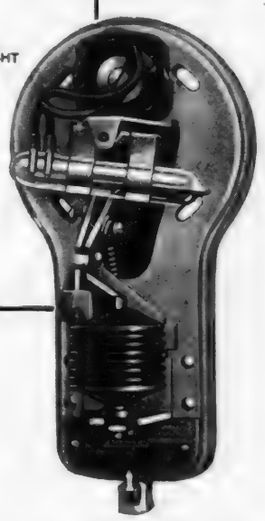
Before opening time the watchman has only to operate the one switch in the engineer's office, which throws the control back to the individual higher temperature MERCOIDS on each Unit Heater.



WIRING DIAGRAM FOR SMALL UNIT HEATERS CONTROLLED ACROSS THE LINE BY MERCOID THERMOSTATS



WIRING DIAGRAM FOR LARGE UNIT HEATERS CONTROLLED BY MAGNETIC STARTING SWITCHES



MERCOID Thermostat No. 845 with cover removed. To prevent tampering, lock and key adjustment is available.

You can *sell* this MERCOID Thermostat *for every* Unit Heater Installation

THE above wiring diagram will show you how the MERCOID Thermostat No. 845 can be used to great advantage as a master night control for factory Unit Heater installations.

Here is an opportunity for extra sales and profit, for every factory owner will quickly see and appreciate the great saving this instrument will effect in both steam and electrical current consumption—You can sell a MERCOID Thermostat for every Unit Heater installation in your locality.

As you know, the Unit Heater installations for factory workrooms carry a daily temperature ranging between an average of 55° and 70°. At night, however, usually all that is required is enough heat to prevent freezing or damage to materials.

In plants where there are many Unit Heaters if the watchman forgets to turn back some of the thermostats, these heaters run at a high temperature all night, thus wasting a considerable amount of steam and current.

It is quite obvious that with one MERCOID master or night control, as shown in the above diagram, this loss and waste can easily be prevented.

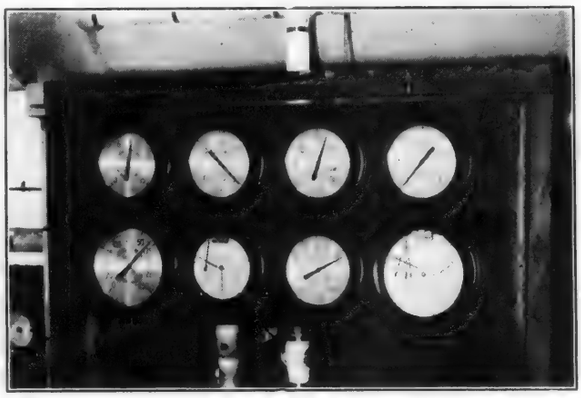
The MERCOID No. 845 featured here is only one of a complete line of MERCOID controls applicable to the control of temperature, pressure and vacuum for manufacturing processes and power plant equipment.

Our experienced engineering staff will gladly cooperate with you in the solution of your customers' control problems.

AMERICAN RADIATOR COMPANY

40 West 40th Street ACCESSORIES DIVISION New York, N. Y.

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, ARCO Packless Valves and devices for drying, humidifying, cooling and refrigeration.



Foxboro Instrument Board of Frankfort Heating Company, Frankfort, Indiana

Any Heating Plant
will bear watching

WHEN you are dealing with temperatures, pressures and vacuum on a large scale, you must have accurate and continuous records to get the most out of your fuel.

For example, a Foxboro Instrument Board can tell the whole story from boiler room to radiator. Foxboro Indicating Thermometers give accurate readings of steam or hot water temperatures. They tell how cold it is outdoors and in. When you combine the written records that Foxboro Recording Thermometers give, you have a permanent check on fuel consumption and boiler room efficiency. Such records are certain to accomplish economies and to furnish invaluable data for future guidance.

There are many applications for Foxboro Instruments to the problems of the heating engineer. We shall be glad to place at your service our experience in solving such problems.

The Foxboro Guarantee sealed to each Recording and Controlling Instrument.

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Detroit Cleveland Tulsa Rochester, N. Y. Atlanta
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Don't Sink Anymore

Sinking tanks in deep holes is old fashioned and expensive.

Sinking down deep in your pocket for anti-syphon valves is also unnecessary.

Now the Preferred Anti-Syphon Valve is approved by the Underwriters' Laboratories.

It is used by men who save time, money and labor.

It is fool-proof.

It is sturdily made of valve bronze throughout.

It is positive and accurate in action.

Its list price is only $7.50.

Do not sink anymore of your money unnecessarily—Save it by using the Preferred Anti-Syphon Valve.

We will be glad to send you any information you request. Write to us today for discounts.

Listed as Standard by Underwriters Laboratories

Preferred utilities are preferred because they are practical in performance and price. They are designed and manufactured for the oil burning industry by oil burning engineers who have been in the oil burning field for years.

Preferred Utilities:

PREFERRED 100% AUTOMATIC DAMPER
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PREFERRED ANTI-SYPHON VALVES
PREFERRED DOUBLE TAPPED BUSHINGS
PREFERRED FLUSH BOXES
PREFERRED VENT PROTECTORS

Other Preferred Utilities are in our laboratory and on test in the field.

Exclusive Distributors for Absolute Con-Tac-Tor Corp., in New England, New York and Northern New Jersey. Complete stock carried in New York City.

PREFERRED UTILITIES MANUFACTURING CORP.

33 West 60th St., New York, N. Y.

5 Horse Power Century Type SC Squirrel Cage Induction 3 and 2 Phase Motor

ANTI-FRICTION BEARINGS

In addition to the regular Century Phosphor Bronze Sleeve-type Bearings, Century Type SC Squirrel Cage Induction 3 and 2 Phase Motors can also be furnished with Anti-Friction Bearings of liberal dimensions. Built in all standard sizes from ¼ to 100 horse power. Temperature rise not more than 40° C.

CENTURY ELECTRIC CO.
1806 Pine Street St. Louis, Mo.

33 Stock Points in the United States and More Than 50 Outside Thereof

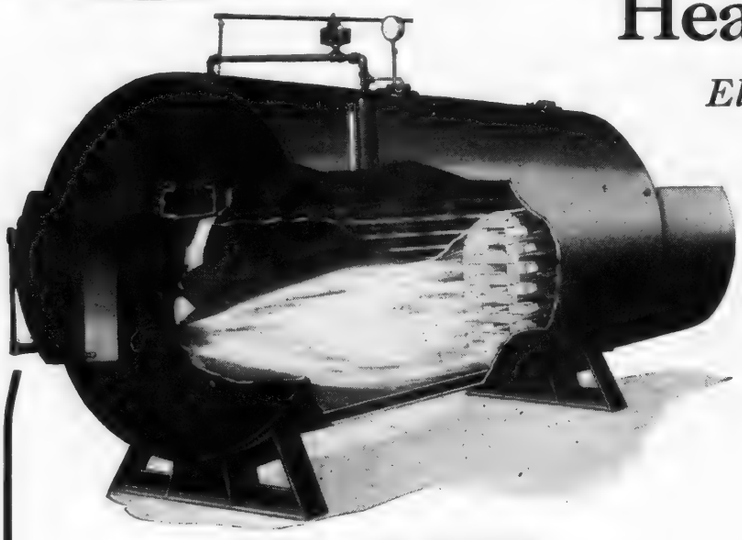
Century MOTORS

"THEY KEEP A-RUNNING"

THE RACINE HEATING BOILER

A Modern Scientific Heating Boiler

Electric Arc Welded



Our fifty years' experience and large facilities have been combined to make this Heating Boiler an outstanding improvement in its line. It combines the finest known types of A.S.M.E. construction and materials. Large combustion space, big water capacity and ample steam space give it the highest degree of efficiency and economy. It is smokeless and the rating is guaranteed. The rapid circulation of the water caused by the circulating tube makes the Racine Heating Boiler ideal for hot water as well as steam. It requires low head room and is the easiest boiler to install and to clean. Boiler is a complete unit when shipped from factory —no brick work to be installed by heating contractor.

AN IDEAL OIL BURNER

We will equip them for any oil burner made —also equipped for coal burning.

Write for descriptive catalog giving specifications, dimensions and prices of 24 different sizes.

FREEMAN MFG. CO., Dept. H, RACINE, WIS.

HOUSE HEATING WITH OIL FUEL

By **P. E. FANSLER,** *Associate Editor, The Heating and Ventilating Magazine*

A representative of one of the largest oil burner manufacturers writes us:

"I have just returned from a trip on the road and find copy of "House Heating With Oil Fuel" which I requested you to mail me here, and I herewith enclose order in payment of same. I have bought all available books published on oil burning during past seven years I have been connected with development work in the field, appointing dealers for oil burners, and there has been nothing yet that approaches this book. Every oil-burner dealer owes it to himself to have a copy. I will advise all of our dealers to get a copy of this book as an absolute essential."

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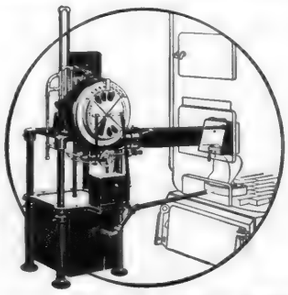

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Graduated Automatic Control
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Distributors—Write for the 1928-29 Sales Plan

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Dept. H • 749 Custer Ave. • Evanston, Ill.

Lad puts Pop right

"Here, Lad—

I've been around on a trip . . I came . . I saw . . I succumbed. You're right, lad, right as a trivet . . Arc Welding is here all right. I'm going to take up welding right away, and in a big way, too. I've just written to my buddie from whom I've bought motors for years, to come and tell me how they developed arc welding and to sell me the right kind of machines for our work. NOW, LAD, OUR SCRAPS ARE ALL OVER."

Only "Stable-Arc" Welders have all these features

Variable Voltage.
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Double Control of Welding Heat.
Steady Arc Throughout Entire Welding Range.
All Steel Construction.
Full Capacity for either Metallic or Carbon Arc Welding.

These features make welding easier. Results—better welds and greater output.

Ask any Operator!

"No, Pop—

they've just started in earnest.

You've taken a step in the right direction with your right foot and have placed the left one on a banana peel . . and you know where that lands anyone.

What does his company know about arc welding development, except what they've picked up from Lincoln's trail blazing with the FIRST variable voltage welder in 1907 . . the FIRST application of welded steel to replacement of castings . . the FIRST application to buildings . . the FIRST application to bridges . . the FIRST to heavy steel pipe . . the FIRST to complete manufacture of motors?

And since you bring up motors, why doesn't your buddie's firm use welding on their motor if their welder has welding licked?

Lincoln has not only licked all welded motors with the Lincoln Welder but has also licked all motors with the welded steel motor.

So why listen to your buddie? He will be like our minister who spoke the other day on the subject "A Living Wage." People WILL choose a subject with which they've had no experience."

The Lincoln Electric Co., Dept. No. 16-7 Cleveland, Ohio

W-60

"Stable Arc"
LINCOLN WELDER

A Donald Douglass Aquatint study of the SCHROEDER HOTEL, Milwaukee, Wisconsin. Architects and Engineers, Holabird & Roche, Chicago; General Contractor, W. M. Oeflein, Inc., Milwaukee.

Where foresight forestalls emergencies

To men who plan hotels, the selection of equipment designed to forestall those emergencies which disrupt highly organized routine and bring discomfort to guests is a matter of primary importance.

In the Schroeder Hotel, Milwaukee, a not uncommon source of trouble was guarded against through installing Jenkins Valves in all plumbing and heating lines. The hotel is assured of low valve maintenance and of the trouble-free service which has characterized the performance of Jenkins Valves for 64 years.

When specifications read "Jenkins Valves, marked with the Jenkins 'Diamond' and signature" long-term service is assured.

Fig. 370 Jenkins Standard Bronze Gate Valve, screwed

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JENKINS BROS., LIMITED
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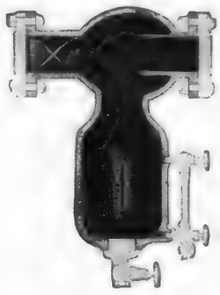
Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

SWARTWOUT
Steam Products

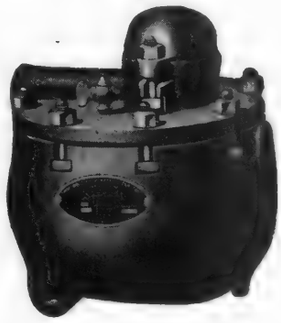
Swartwout Air Separator
Either cast iron or cast steel.
99% Dry Steam Guaranteed

Swartwout Cast Iron Exhaust Head
Built to last a lifetime

Swartwout Low Pressure Float Trap
Large Capacity—Self-Cleaning Valve



Swartwout Steam Separator
Separation by the centrifugal principle



Swartwout Bucket Type Steam Trap
Intermittent action—pressures to 250 lbs. Trouble-Free.

The products illustrated are only a part of the Swartwout line. We would like to give you full information on Swartwout Traps, Separators, Exhaust Heads and Strainers.

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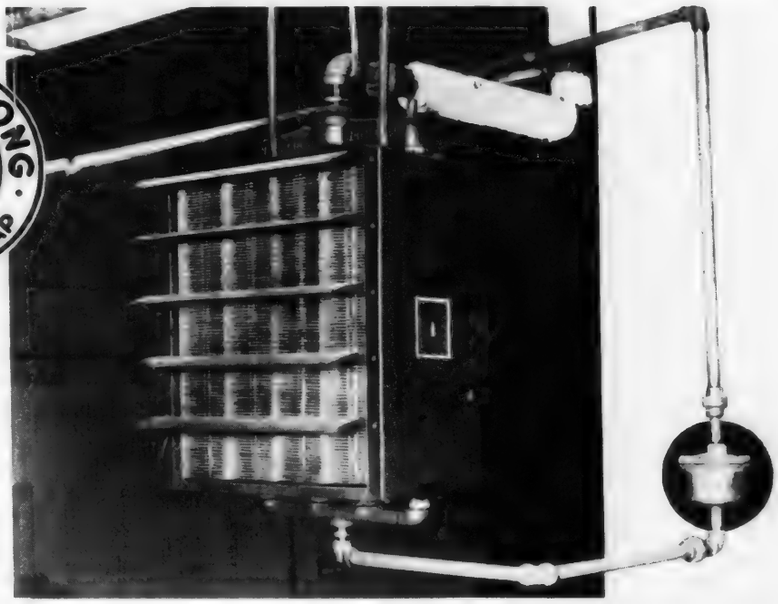

Unit heater drained with an individual Armstrong Steam Trap. Note simplicity of installation.

Put an Armstrong steam trap *under each unit heater*

ARMSTRONG Steam Traps increase the efficiency of heating systems because they keep the heating coils and steam lines free of condensate and air, permitting maximum heating effect with a minimum consumption of steam.

Armstrong Traps are water sealed at all times and live steam can not escape through the discharge valve. The small size of Armstrong Traps permits a simple and neat installation. No supports are necessary. They are merely inserted in the drain line.

Because of the low cost of Armstrong Steam Traps, each heater in a system can be individually drained at a very small investment. It has been ascertained that the majority of Armstrong Trap installations save their cost in one season of heating.

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Hot water is a vital part of modern hotel service —plenty of hot water, good and hot.

New York's great Manger Hotel, with its 1750 rooms, solved its hot water problem the same way that hundreds of other hotels, apartments, clubs, and institutions solved theirs, by installing Patterson Hot Water Heaters.

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Hot Water Heaters

The Patterson-Kelley Co.

107 East 40th Street **New York City**

BOOKS ON HEATING AND VENTILATION

THE DESIGN OF GRAVITY-CIRCULATION WATER HEATING SYSTEMS, by F. E. Giesecke, Ph. D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the entire water heating section of the A. S. H. & V. E. Compendium of Modern Practice has been discarded and replaced with a new section by Doctor Giesecke, embodying the methods here presented in detail. 64 pages of text and 10 pages of tables and charts. Price, $3.00.

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THE HEATING and VENTILATING MAGAZINE
386 FOURTH AVE., NEW YORK

The Largest Month in Reed History

More Reed Air Filters—both Streamline and Standard Unit types—were bought during the month of May, 1928, than in any two previous months!

May sales this year larger by 58 per cent than sales in May, 1927!

And 60 per cent of this business was repeat orders from present users of Reed Air Filters!

Striking evidence of the widespread and continually growing recognition of the superiority of Reed equipment. REED AIR FILTER CO., Incorporated, 204 Central Ave., Louisville, Kentucky.

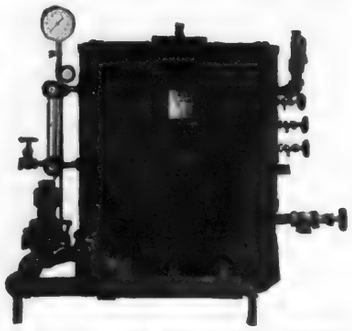
World's Largest Manufacturer of Air Filters

Reed Air

TRADE MARK

filters ALL METAL

Plenty of Steam



In low water type shown above condensate returns to boiler without use of traps or pumps; this type is used for pressing machines, dryers and matrix or steam tables. The standard type is used by Bakeries, Bottling Plants, Candy Manufacturers, Clothing Manufacturers, Dairies, Hosiery Mills, Hospitals, Hotels and Restaurants, Laundries, Bakelite Molders, Paper Box Manufacturers, etc.

— HIGH OR LOW PRESSURE —

for Process Work is assured when The KANE Automatic Gas Boiler is on the job. Steam is produced quickly and just when you want it, without worry, fuss or bother. And best of all there are no ashes; dirt and dust are banished and coal shoveling is a thing of the past. Placed right alongside the work to be done, The KANE speeds up production and assists in obtaining the uniformly high quality of work that is so desirable and profitable.

Write for Literature

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Manufacturers of GAS FIRED BOILERS AND WATER HEATERS

1903-1915 EAST HAGERT STREET—PHILADELPHIA

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CENTRAL STATION STEAM CO.

2912 East Woodbridge St.
DETROIT, MICHIGAN

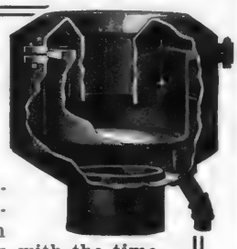
MANUFACTURERS OF

Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

DICKINSON

ALL-CAST-IRON
EXHAUST HEAD
Saves the Roof



When oil and water content of exhaust steam is allowed to fall constantly upon a roof, a condition of decay and disintegration sets in with the time for repairs not far off. Dickinson Exhaust Heads overcome necessity of constant repairs, and being made of cast iron, will last as long as the building.

ÆOLUS DICKINSON
3336-44 So. Artesian Ave. CHICAGO
(Some territory open for agents)

Save ½ Your Coal Bill

Write for booklet containing complete details and list of prominent installations giving satisfactory service.

Sole Distributors in United States and Canada.

WITH COPPUS (REGISTERED U.S. PAT. OFFICE) UNDER-GRATE DRAFT BLOWER

For all classes of heating plants in Homes, Schools, Churches, Office and Public Buildings, Apartments, etc. Burns Buckwheat Coal in any boiler or heater with no changes in grates, scientifically constructed. Burns any grade of coal. Anyone can operate a COPPUS.

INTERNATIONAL FUEL SERVICE CORP. BRIDGEPORT, CONN.

This is Our Idea of an Efficient Air Washer — do you agree with us?

— non clogging. No fine orifice nozzles to become clogged with entrained solids in the water and cause holes in the water screen.

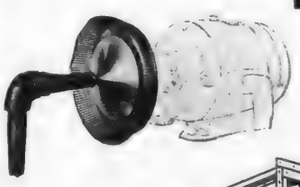
— in place of a bank of fine orifice nozzles; a motor driven centrifugal water sprayer, delivering a water screen the equal of 100 ordinary spraying nozzles.

— a single fire type nozzle large enough to permit the passage of entrained solids in the washing water; thus allowing continued use of same water.

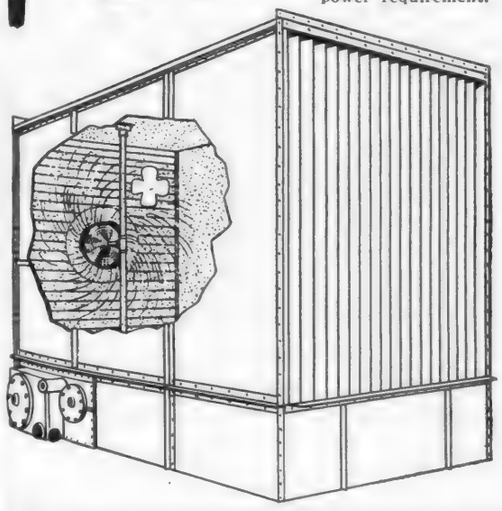
— a dense mist screen obtained by directing the water from the single nozzle to a rapidly revolving rotor where it is churned centrifugally into an even, solid spray.

— 40 to 60% power requirement of multiple nozzle system because only 7 lbs. per square inch pressure is needed at the nozzle.

— by replacing multiple nozzle banks with Bayley Turbo-Atomizers present inefficient installations of air washers can be made highly efficient.



The Bayley Turbo-Atomizer and below the complete Bayley Turbo Air Washer. Non clogging and operating with nominal water pressure at low power requirement.



That briefly is the Bayley concept of an efficient air washer and the manner in which the Bayley Turbo-Air-Washer is built and operates. Scores of installations have proven it successful. May we tell you where they are and state the argument more fully by means of Bulletin No. 25?

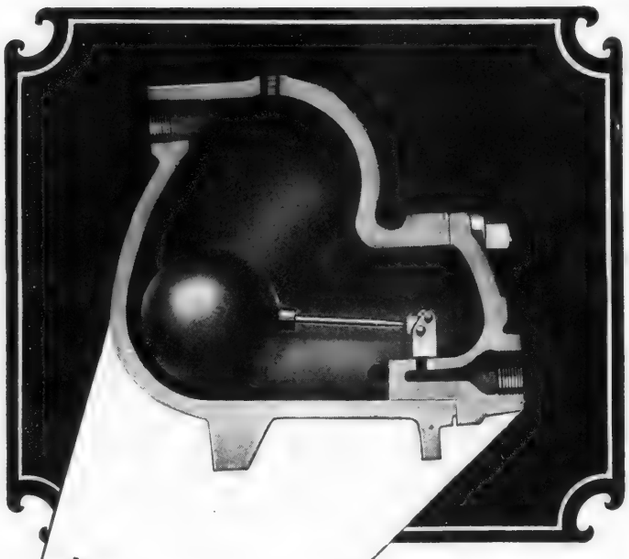
BAYLEY BLOWER COMPANY

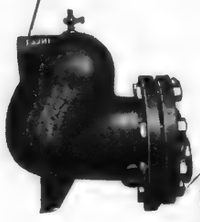
742 Greenbush St., Milwaukee, Wis.

Bayley

AIR ENGINEERING & EQUIPMENT

HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS — PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS





It's What's Inside—

that determines the efficiency and up-keep cost

A few of the concerns who are continually repeating their orders for Paracoil Steam Traps.

Interborough Rapid Transit
Borden Company
Naval Air Station—Pensacola
Public Service of New Jersey
Consolidated Gas—Brooklyn
Teachers College, New York
American Steam Laundry
General Carbonic
DuPont
Bethlehem Steel Co.
Postum Building
American Sugar Refining Company
Argentine Government Oil Refineries
Toluol Products Corporation
American Smelting & Refining Co.
General Baking Co.
Ballard Oil Equipment Corp.
Hercules Powder Co.

So simple is the inside of the Paracoil Steam Trap that this sturdy trap lasts indefinitely without repairs or attention. There is only one moving part, the recessed valve ball, which is a special alloy of aluminum bronze and does not lift but rotates over the port. This assures long wear and a tight contact.

A two-year guarantee *against repairs* goes with each trap. But the "no repair" records of concerns using the Paracoil run many years beyond the guarantee.

Simplicity—with efficiency—means surer operation and freedom from repairs.

Write for Catalog and Specifications

DAVIS ENGINEERING CORP.
90 West St., New York
Factory: Elizabeth, N. J.

Paracoil STEAM TRAPS

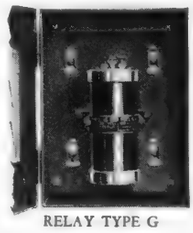
—a line of controls you'll be proud to represent

Teeple Controls meet every problem of heat control for gas furnaces and boilers; unit heaters; refrigerating plants; ovens; furnaces; and automatic coal and oil burners. Accuracy and reliability are built into every instrument manufactured. You can recommend Teeple Controls to your customers.

CLOCK THERMOSTAT

Write for this new Catalog....

Our latest catalog fully illustrates and describes the full line of Teeple Controls. Gladly sent.



RELAY TYPE G

L. R. TEEPLE CO.
540 E. 9th St., Portland, Oregon

TEEPLE TEMPERATURE Controls

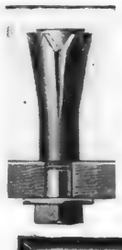
for GAS — STEAM — WATER — AIR

Have YOU One?

All Heating and Ventilating Engineers are entitled to a copy of this Junior Catalog No. 21. Check off those items below in which you are interested, mail to us, and you will receive this catalog, prices, and whatever you may need in the way of information on any Atlas product.

☐ Reducing Valves ☐ Float Valves
☐ Temperature Regulators ☐ Swing Joint Fittings
☐ Bronze Unions
☐ Damper Regulators ☐ Thermostats
☐ Pump Governors ☐ Balanced Valves

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.



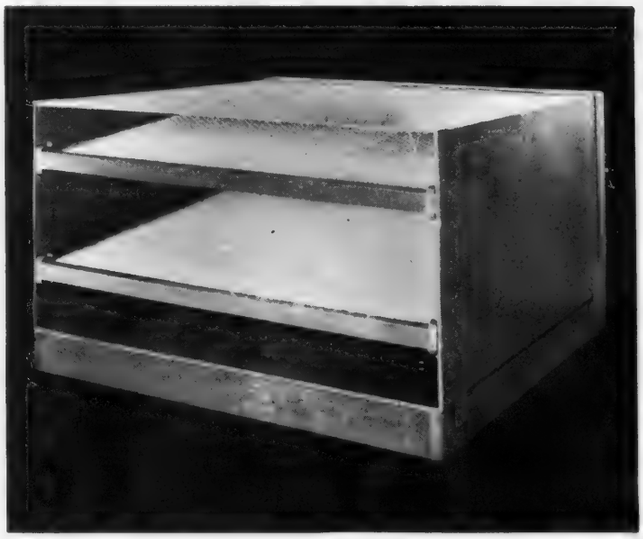
P-H-I-L-L-I-P-S

Self-Drilling Expansion Shells

Quick, economical and reliable for fastening equipment to concrete walls, ceilings, floors, beams and columns. Have internal U. S. Standard threads for rods, bolts and screws. Quickly installed by hand or with Phillips Spring Hammer. Every shell makes its own hole. No drills required.

PHILLIPS DRILL COMPANY
1537 Cortland Street **Chicago, Ill.**

The NATIONAL AIRMAT new Cabinet Filter



Fits any space

The utmost flexibility in locating an air filter is provided in the new National AIRMAT Cabinet Filter type. In addition to the fact that it is designed on the sectional principle, the air can be passed through in either direction permitting the arrangement of space for renewing the filter on either side of the installation. Each section has a rated capacity of 1000 c.f.m. The total desired capacity divided by 1000 gives the number of sections required. This number of 1 ft. by 2 ft. units can be arranged in any way to best utilize the space available.

The Original Dry Process Air Filter

Easy to install

It requires no skilled mechanics to build up an installation of AIRMAT Filters. These cabinets go together as easily as sectional filing cases. There are no engineering problems for the contractor to solve. There is no machinery to install and test out. No accessories to worry about. The man on the job just builds up the sheet metal cabinets, connects the ducts, inserts the wire frames with their AIRMAT fillers, and turns on the air. Contractors appreciate this new standard of simplicity in air filter installation and their cost estimates naturally reflect their attitude.

Ask for the AIRMAT folder!

No servicing problem

Servicing is reduced to such a simple matter with the AIRMAT filter that it ceases to be a problem. There is no "wash day." The filtering medium is a sheet of AIRMAT, a special fibrous product developed for this exclusive use. This sheet is held in a wire frame which slides into the cabinet. When a sheet is soiled, the frame is pulled out, the old sheet thrown away, a new one inserted and the frame replaced. It's about as hard and as disagreeable as changing a desk blotter. Renewal costs less with the AIRMAT than with any manually serviced filter on the market.

NATIONAL AIR FILTER COMPANY

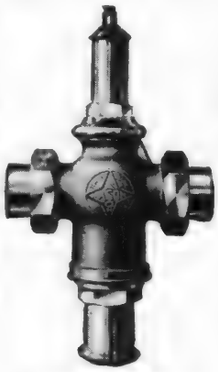
5130 Ravenswood Avenue
Chicago, Illinois

H&V-7-Gray

Exceeds the highest Government standard

Flavor and food value unequalled . . . Baker's Cocoa is made in a plant that has a large and very complete installation of Mason Regulators. In the heating system, cooling system and for regulating pressures throughout the plant, they form an important part of the pressure control equipment.

Designed, built and tested to work efficiently and with the least amount of attention, Mason Regulators are the choice of plant engineers in every industry because they give accurate, trouble-free service under the most exacting conditions.



Mason Standard Reducing Valve

Write for a copy of new Catalog No. 62.

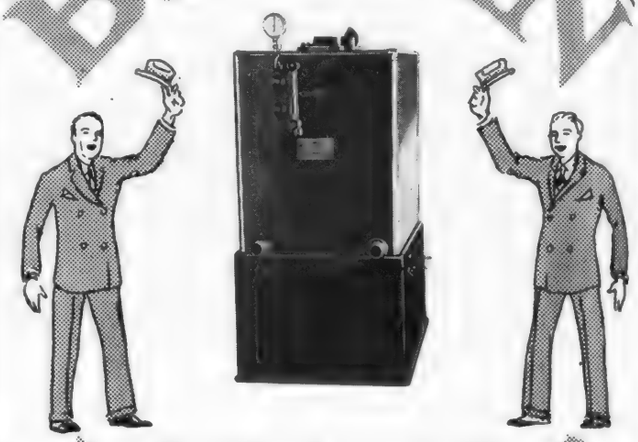
Mason Regulators

MASON REGULATOR CO.

BOSTON, MASS.

1924

BRYAN



Designed especially for Oil & Gas

BOILERS

In this modern age, specialized products are very much in demand. A product made to serve one purpose is certainly better for that purpose than one which is converted to a use entirely foreign from that for which it was originally intended.

Bryan Boilers are designed for use with Oil and Gas burners ***and nothing else.*** Years of patient effort and experimentation are reflected in the perfected BRYAN. A BRYAN allows the utmost in economy with the greatest ease of operation and years of trouble-free service.

Alert dealers are finding the Bryan Boiler to be a very profitable article to merchandise. Every Oil user is a live prospect and the sales resistance is small. It couldn't be otherwise when users everywhere are reporting a savings of 30 to 50% in their oil bills.

BRYAN STEAM CORP.

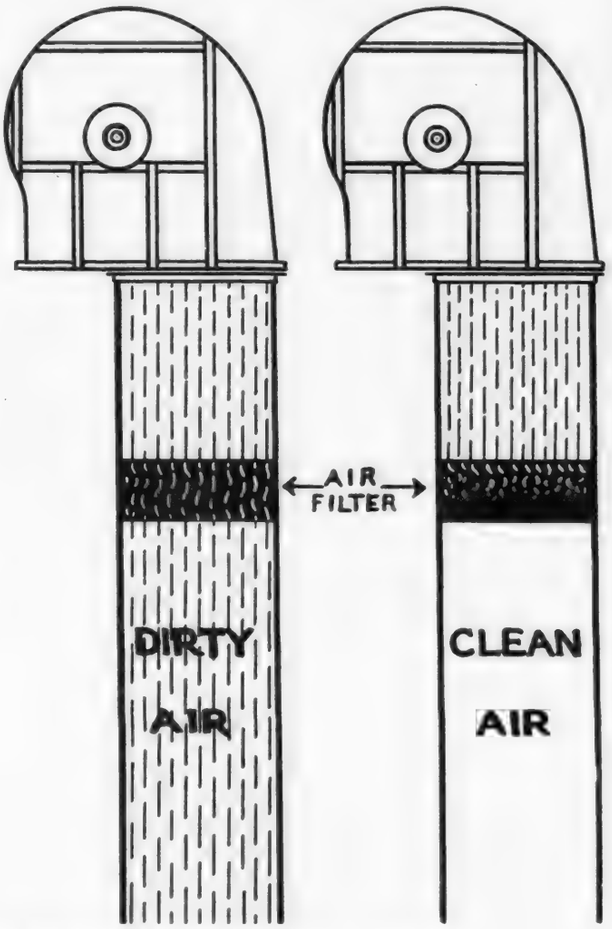
(BOILER DIVISION)

502 Bryan Bldg. PERU, INDIANA

What Happens When Your Fans Slow Down?

Must your fans be running at full capacity in order to keep air filters working at high efficiency? Does lower air velocity through the filter—in the Winter, for instance—mean poor impingement of dust particles upon the filter medium?

Not when the filter is a—



Automatic Model "H"

Midwest Horizontal Self-Cleaning Air Filter

Here is an air filter which gives high cleaning efficiency when working at 2/3 load as well as at full capacity—because it really *filters the air* scientifically by splitting it up into a multiplicity of fine sub-currents, without increasing the resistance of the air flow.

MIDWEST AIR FILTERS
INCORPORATED

BRADFORD, PA. **Offices in Principal Cities**

Without Draining Boiler!

The Ideal Damper Regulator for Closed Hot Water Systems

TYPE F

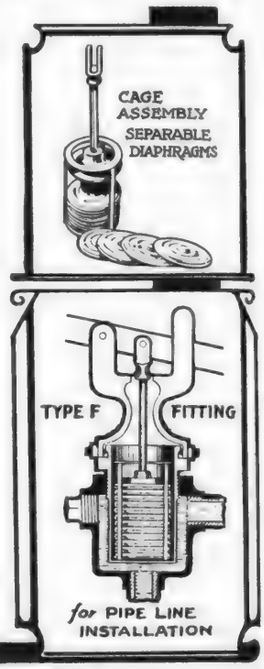
Each Metaphram is a hermetically sealed "wafer" which expands with increase of temperature. Twelve Metaphrams are used in Type F.

Standard equipment on the better boilers.

2"

With the "dry well" in place it is never necessary to drain the boiler to inspect or replace parts of a type F

METAPHRAM DAMPER REGULATOR



One of most powerful and most sensitive of regulators. The Metaphrams operate in a dry well which projects down into the boiler, or in Special Fitting or a Y in pipe line, and is surrounded by water. Slight change in temperature affects Metaphrams, which operate lever. Gradual action—powerful but sensitive.

Make your installation complete, more satisfactory and more profitable. Use type F on new or old jobs. Order from your jobber or direct.

NATIONAL REGULATOR CO.
2301 KNOX AVENUE CHICAGO
Manufacturers of the National System of Automatic Temperature Control

TRADE METAPHRAM MARK

New small size Bristol's Recording Thermometer. Provides continuous temperature record over period of 72 hours.

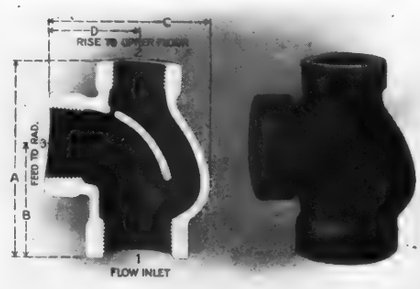
Use It Anywhere!

—to record atmospheric temperatures in refrigerating rooms—storage rooms—theatres—hotels—office buildings—schools, etc. etc. The new Bristol's thermometer illustrated is simply and ruggedly constructed; entirely self-contained, thus easily portable. Accurate, trouble-free operation is assured. Complete information given in Bulletin No. 363. Write for a copy.

The Bristol Company
WATERBURY, CONNECTICUT

Blake Testite O. S. Distributor Fittings

SAVE FITTINGS, LABOR, FUEL—
INCREASE CIRCULATION



For Hot Water Heating Systems and Domestic Hot Water Supply

Perfect Control of the Circulation. No Short Circuiting. The Lip Distributes the Water Evenly

Made in 39 Sizes
Your Jobber Will Furnish Them

BLAKE SPECIALTY COMPANY
ROCK ISLAND, ILLINOIS

ASBESTOCEL

A NATIONALLY STANDARDIZED INSULATION FOR HEATER PIPES

The choice of insulation for heater pipes is exceedingly important, yet the decision is easily made. Improved Asbestocel is the low-pressure pipe insulation which is nationally sold and which is standard in quality and performance everywhere. When you apply 3-ply Asbestocel you know that the performance and the appearance of the insulation will be the same wherever the building is located, and whatever its size is. There is no other heater pipe insulation which offers you such standardization.

National advertising in general magazines, building papers and other trade papers, keeps Asbestocel before the public. Building committees and individual house owners know the name and will gladly accept your suggestion of Asbestocel.

Asbestocel is a product of Johns-Manville, pioneer workers in Asbestos. It is guaranteed by Johns-Manville to be stronger and more efficient than any of the ordinary air cell insulations.

Because Improved Asbestocel is standard in length and diameter it can be applied more rapidly than the odd lengths and sizes of ordinary air cell. A neat looking job completed more rapidly is the result.

Johns-Manville maintains a large department for the purpose of coöperating with the plumbing and steam-fitting trade on many problems connected with heating houses and buildings of all types. We invite your inquiries, which entail no obligation. Address: Johns-Manville Corporation, Improved Asbestocel Department, 292 Madison Avenue, New York City.

MASTER of ASBESTOS

Johns-Manville

IMPROVED ASBESTOCEL

The International Nickel Company, Huntington, W. Va.
40 tons of Clow Gasteam Radiators used.

From A Small Station To A Huge Factory

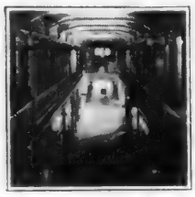
"Everywhere" you look there's business with Clow Gasteam Radiators

Illinois Central R.R.
Sub Station
47th St., Chicago, Ill.
Gasteam Equipped

Here are four more types of jobs, showing the wide application of Clow Gasteam Radiators. Look at the illustrations: A suburban railroad station—a factory with 2/3 of a million cubic feet of space to heat. Then, a huge arcade and office building consisting of 58 stores and 31 offices—a moderately sized school club house. They are all heated entirely with Clow Gasteam Radiators.

Friends School
Club House
Homeland.
Baltimore, Md.
Gasteam Equipped

Clow Gasteam is either vented or unvented to meet every heating requirement in any section of the country. Unvented for dry climates. Vented — the products of combustion are carried off to the outside. Each Clow Gasteam Radiator is an independent unit, giving steam for heat, and using gas for fuel.



Camayo Arcade and
Office Building
Charleston, W. Va.
Gasteam Equipped

Our catalog will interest gas heating men and heating contractors. Your name will bring a copy.

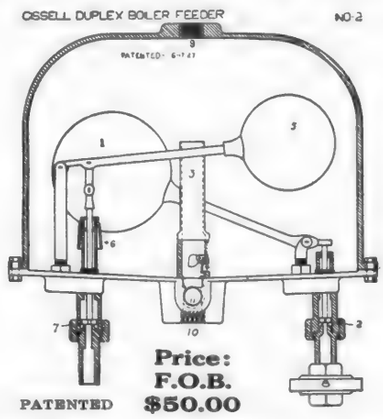
JAMES B. CLOW & SONS
201-299 No. Talman Ave., CHICAGO

CLOW GASTEAM

Now is the Time

For Real Boiler Protection

While Also Increasing Its Efficiency



Price: F.O.B.
PATENTED **$50.00**

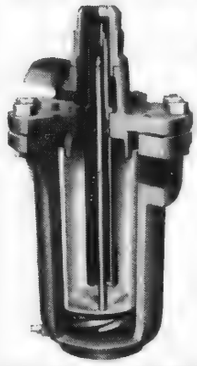
This Duplex feeder, built especially to meet conditions existing in heating boilers, will make your boiler absolutely automatic, eliminating danger of burning boiler or cracking sections. In selecting a boiler feeder you want the best; thousands of these feeders are in use and never a complaint. So sure are we as to its efficiency, that we sell it with an ABSOLUTE GUARANTEE.

Write for Full Particulars and Discount

Manufactured by

W. M. CISSELL MFG. CO., INC.
111 South Second Street LOUISVILLE, KY.

Trerice Steam Trap



Revolving valve cleans seat and produces uniform wear on same.

High chrome steel valve and seat. Sent anywhere for free trial.

Some good territory still available. Liberal contracts. Stock sent on consignment.

Write for full particulars to

H. O. TRERICE COMPANY
1338 West Lafayette Blvd.
Detroit, Michigan

ROSS

Crosshead-GUIDED Expansion Joint Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.

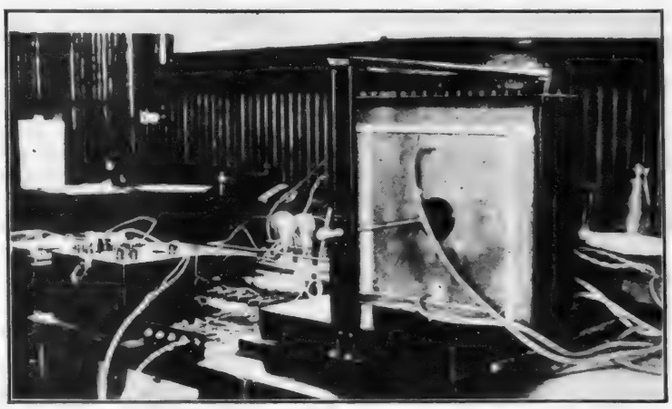
New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

Tests Are Better Than Promises

ONE of the first things an engineer learns is to take nobody's unsupported claim for anything—but especially claims of people who have something to sell him.

* * *

IT makes no difference how well he knows the salesman or how respectable the concern represented. Even very definite guarantees count for little unless the engineering of the product convinces him that the guarantee is justified. It is a well known fact—and guarantors know it, too—that guarantees are seldom enforced.



Testing Ric-wiL Filler to determine Thermal conductivity. Test machine built by Professor F. E. Rowley, Department of Experimental Engineering, University of Minnesota.

* * *

BUT actual laboratory and field tests properly conducted by disinterested experts do give an engineer evidence he can accept. There is no reason why such evidence should not be asked for and received, especially where the undertaking involves a large investment as in the case of underground heating lines. There is only one reason why a manufacturer would refuse to give it.

The Ric-wiL Company has learned the efficiency of its own products through such tests. And the records will be promptly furnished to any engineer who is interested. Some of the tests cover such subjects as:

* * *

THE installed and operating efficiency of Ric-wiL Conduit.

Strength of Ric-wiL Conduit, part by part and completely assembled in laboratory and field installed.

Watertight character of Ric-wiL Conduit.

Efficiency of Ric-wiL No. 1 insulating filler.

Waterproof quality of Ric-wiL Dry-paC Filler.

(Note: With every shipment of Dry-paC we furnish a formal warranty that test has been made of the material and its waterproof quality assured.)

* * *

Special laboratory tests will be made, on request, of Ric-wiL or other insulating materials. Or, we will furnish samples of our products for testing purposes.

THE RIC-WIL COMPANY

Originators of Waterproof Conduit Filler

1567 Union Trust Bldg. Cleveland, Ohio

RIC-WIL

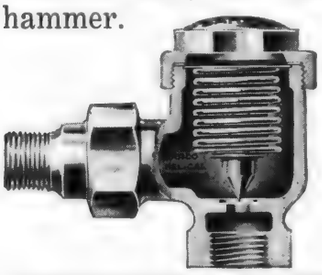
UNDERGROUND CONDUIT

SARCO
Radiator Traps

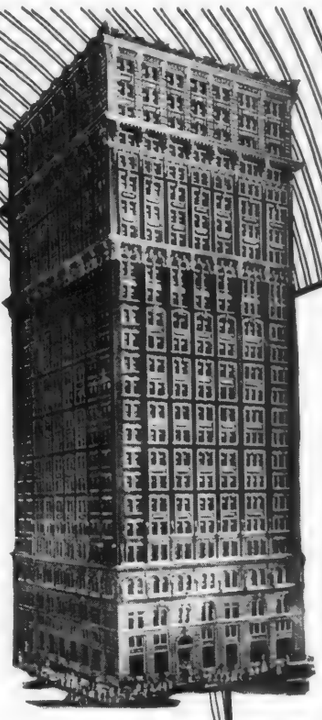
The helical bellows of Sarco Radiator Traps is of large diameter with a heavy wall, insuring even distribution of movement, preventing crystallization of metal and adding years to the life.

A full ¼" movement from open to closed position gives rapid circulation and extra large capacity.

Sarco Traps are noiseless in operation, won't freeze, air bind or cause water hammer.



Other advantages explained in booklet P-100. Send for a copy.



Sarco
Replaces Other Traps Here

When remodeling the heating system of this building, 1500 Sarco Radiator Traps were installed to replace the inefficient traps previously used.

That speaks volumes for the Sarco.

SARCO CO., Inc.
183 Madison Ave., New York City

Boston Cleveland Pittsburgh
Buffalo Detroit St. Louis
Chicago Philadelphia
Peacock Bros., Ltd., Montreal

"We keep others in Hot Water"

SIMS

Storage type water heaters are furnished with "U" tubes as illustrated, or with straight tubes and floating head, as may be desired or specified.

SIMS

Water tube heaters and Converters are also constructed with either straight or "U" tubes.

All heaters are produced complete in our plant. They are not an assembly of parts built by others.

THE SIMS COMPANY, P. O. Box 700 Erie, Penna.

Mr. B.T.U.
Grand Ruler of the Realm of Heat
Says :~

"NO INSULATION LIKE ROCK WOOL NO ROCK WOOL LIKE BANROC"

BANROC not only has the highest efficiency rating accorded any commercial insulation by the United States Bureau of Standards, but the nature of the material itself and the method of application contribute to even greater efficiency and everlasting service.

Expansion and contraction have no effect on BANROC. There is no opening of seams or cracks to lose heat. It will not crack or peel off, yet is easily removed and replaced whenever repair or inspection of equipment is required.

And BANROC is everlasting — nothing about it to settle, decay or disintegrate.

Yet this unusual insulating material costs no more — to buy or to apply, and even if it did, the heat it saves would much more than offset the difference.

Put BANROC on your list of specifications. Let the BANROC representative nearest you, work with you on your heat-saving problem. Your inquiry will receive prompt attention and incur no obligation.

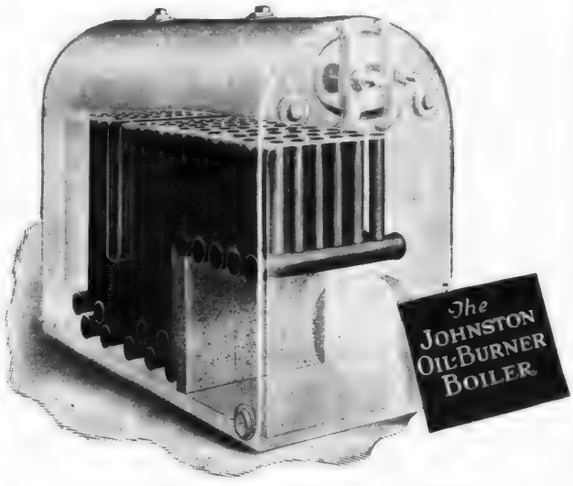
BANNER ROCK PRODUCTS CO.
ALEXANDRIA, INDIANA
ORIGINATORS OF ROCK WOOL PRODUCTS

Branch Offices in the Following Cities
Consult Telephone Directory

BOSTON	PHILADELPHIA	CHICAGO
NEW YORK	PITTSBURGH	ST. LOUIS
BUFFALO	CLEVELAND	HOUSTON
NEWARK	TOLEDO	TULSA
DENVER	DETROIT	SAN FRANCISCO
	LOS ANGELES	

BANROC INSULATION

MAKING IT EASIER TO SELL OIL BURNERS



25 TO 50 PER CENT SAVING IN FUEL

Here is the secret of boosting your oil burner sales: Johnston Brothers have designed a boiler, especially for oil burners, that reduces fuel costs from 25 to 50 per cent, enabling you to overcome the high cost of operation objection that many buyers advance.

Your oil burner and the Johnston Oil-Burner-Boiler will make an unbeatable sales combination that will enable you to get many more names on the dotted line. It will pay you to investigate the Johnston way to greater sales volume. Write us today for our catalog and special dealer proposition.

Johnston Brothers, Inc.

Ferrysburg, Michigan

Mail Coupon for Catalog and Dealer Proposition.

Johnston Brothers, Inc.
Ferrysburg, Mich.

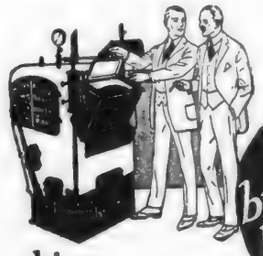
Please send catalog and complete dealer's proposition to:

Name .....

Address .....

City .....

State .....



NO FORCED DRAFT

burns No. 1 Buckwheat

Breaking the Record for Low Coal Bills and Efficiency!

Low pressure steam and hot water heating boilers and tank heaters that burn No. 1 Buckwheat . . . . . No mixing with expensive coal . . . . . Magazine needs filling only once in 12 to 24 hours . . . . . No blower. No motor. No electric current. No machinery to get out of order . . . . . Twenty-one sizes . . . . . *Coal bills cut one half!*

Have you our Catalog and Price Sheets?

The MOLBY HEATING BOILER

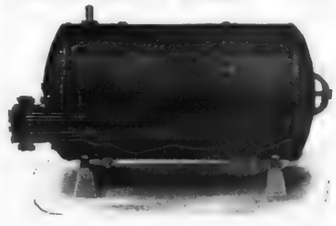
and **Heavy Duty Tank Heater**

MOLBY BOILER COMPANY

(Subsidiary of The Universal Pipe and Radiator Company)
New York: Graybar Building, 420 Lexington Ave.
Landsdale. Pa.: 41 Central Ave.

Alberger Buffalo Heaters

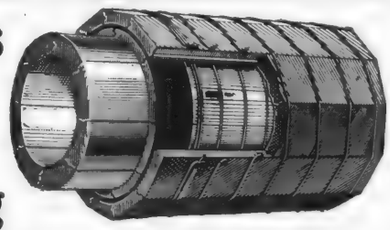
are built for a great variety of standard and special operating conditions for heating water with steam or for the interchange of heat from one liquid to another.



Instantaneous Heaters
Storage Heaters
Swimming Pool Heaters
Economizers
Coolers
Heat Interchangers

ALBERGER HEATER CO. 285 Chicago St.
HOWARD IRON WORKS Buffalo, N. Y.

Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

INSULITE ENGINEERS

Prepared This Portfolio

You will find it helpful in figuring heating jobs, insulation being a factor that must be reckoned with

Proper insulation and the prevention of moisture condensation are just as important as radiation itself in figuring heating jobs.

No heating plant gets a fair show without good insulation. The plant generates heat; the insulation conserves it and "makes it work" to the satisfaction of owner and tenant.

Insulation tends to increase the efficiency of such installations.

INSULITE offers the sure, satisfactory solution. For roof insulation it is made in one inch and one-half inch thicknesses. It has great strength, great heat resisting value, is easy to handle and work with. Waste through breakage is eliminated. Moisture and exposure do not injure it.

The INSULITE engineering staff, which prepared the portfolio here offered, will be glad to confer with you on any heating problem. The portfolio contains helpful charts and data. Send for a copy today.

INSULITE
the Wood-Fiber Insulating Board

THE INSULITE COMPANY
1204 Builders Exchange
MINNEAPOLIS MINNESOTA

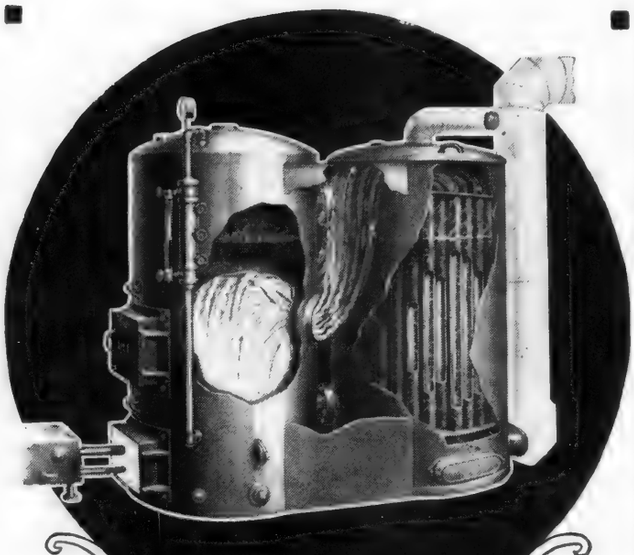
The Insulite Company,
1204 Builders Exchange,
Minneapolis, Minn.

Please send your Insulation portfolio.

Name .....

Address .....

City .....State .....



Leader KOOLSTACK BOILERS

for **Oil Burning**

AMAZING ECONOMY in Fuel Consumption

PERFORMANCE records show that the ordinary type of boilers, usually installed with oil burners, will consume from 35% to 50% **more** fuel than with the same burner installed in a Koolstack Boiler.

A Koolstack plus an efficient burner will show astonishing results in fuel savings. It is the ideal combination for convenience and economy in heating.

Why burn 35% to 50% more fuel?

Write today for bulletin describing these economical Koolstack Boilers.

LEADER IRON WORKS

2150 N. Jasper St., DECATUR, ILLINOIS.
21 East 40th St., New York, N. Y.

GORTON ONE PIPE VAPOR SYSTEM

Find Out for Yourself

The Gorton One Pipe Vapor Heating System and Gorton Appliances, will solve many of your heating problems.

Whether you are installing a complete new system or whether you are remodeling an old one, we can be of great assistance to you.

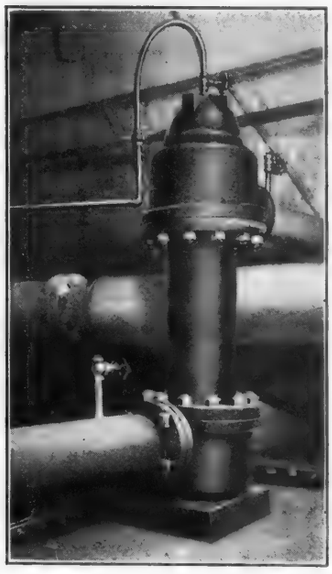
Why not write us and let us tell you about the Gorton System and Gorton Appliances? The information will pay you well.

GORTON HEATING CORPORATION
Formerly Gorton & Lidgerwood Co., (Established 1887)
96 Liberty Street, New York City

GORTON ONE PIPE VAPOR SYSTEM

Corrosion Protection

IS THE SOLE PURPOSE OF

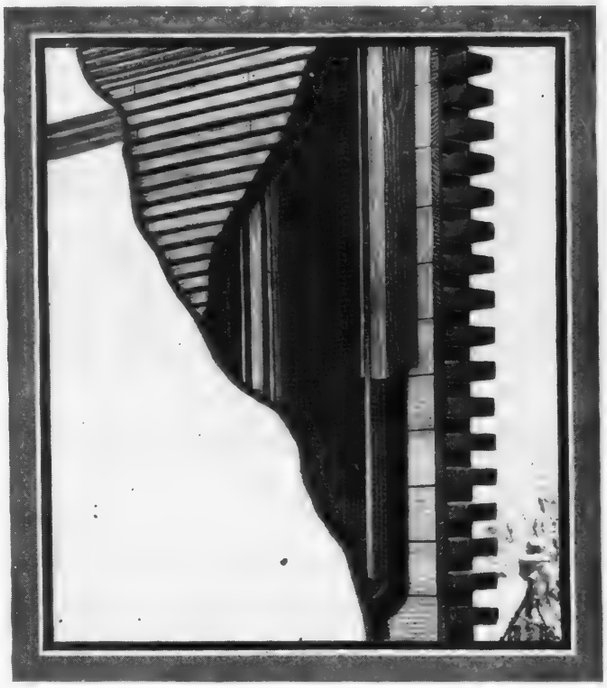


The Hickman Air Separator

**Low in Cost—
Easy to Install—
Maintenance Nil—
Certainly Worth
Investigating**

*Write for
Bulletin No. 3*

WESTERN ENGINEERING CO.
215 Market Street
SAN FRANCISCO CALIF.

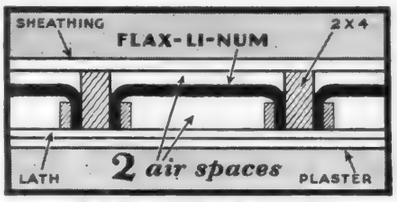


Insulation is at its best

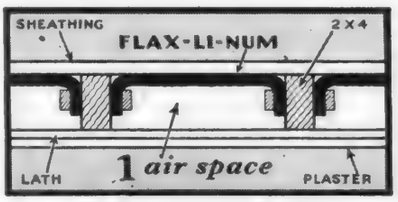
when 2 *air spaces* are formed with Flax-li-num

DON'T be satisfied with *any* insulation installed the *easiest* way.

Insulation is at its best when it forms *2 air spaces* in the wall. Tests by the U.S. Bureau of Standards prove that ½" material, installed in the center of the wall, is equal to ¾" insulation used as a plaster base, or in contact with sheathing. FLAX-LI-NUM was made to fit the 2-air-space method. Its ½" sheets are delivered ready to install *between the studs*. They go in quickly with no waste.



THE RIGHT WAY



THE WRONG WAY

The 1" sheets for the roof give correct thickness in one piece, simplifying installation and reducing handling cost.

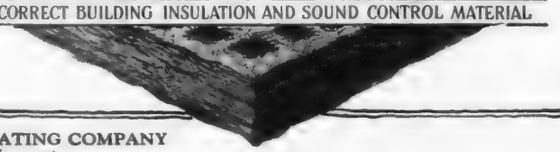
FLAX-LI-NUM, made from purified flax, does not tear, puncture nor break. It stays in place, in perfect condition, for the life of the building.

Send for complete information about the 2-air-space method and FLAX-LI-NUM.

FLAX-LI-NUM INSULATING COMPANY
ST. PAUL, MINNESOTA

Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL



FLAX-LI-NUM INSULATING COMPANY
St. Paul, Minnesota

Send me details of the two-air-space method of insulation and complete information about Flax-li-num.

Name..... Address.....

City..... State.....

WESTCHESTER-BILTMORE COUNTRY CLUB,
Rye, N. Y.

Warren & Wetmore,
Architects

Jarcho Bros.,
Plumbing & Heating Contractors

WHITLOCK HEAT TRANSFER PRODUCTS

Consult your local telephone directory

New York Boston Philadelphia
Chicago Baltimore Detroit
Los Angeles San Francisco
And Other Principal Cities

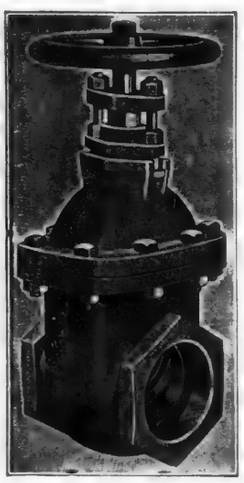
After the game—a hot shower!

Golf—Tennis—Polo—sports of all kinds. They all say "The best part of the game is the hot shower afterwards."

At the Westchester-Biltmore, the hot water supply never fails. The architects made ample provision for peak demand. Two Type K Heaters, 48 x 144, with an hourly capacity of 2,000 gallons each provide *plenty* of hot water . . . and for all other service too. A Whitlock Hot Water Engineer will be glad to give you the benefit of the combined experience of our entire organization, in connection with any building you may be planning.

THE WHITLOCK COIL PIPE COMPANY
20 South Street :-: :-: Hartford, Conn.

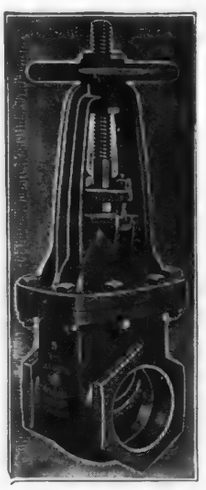
IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings



Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

Two Methods of Heating

Notice how completely ATHEY Weatherstrips seal the window against drafts, dust, and smoke by the cloth-to-metal contact—the most thorough method devised that makes windows weather-tight without making them hard to open and close.

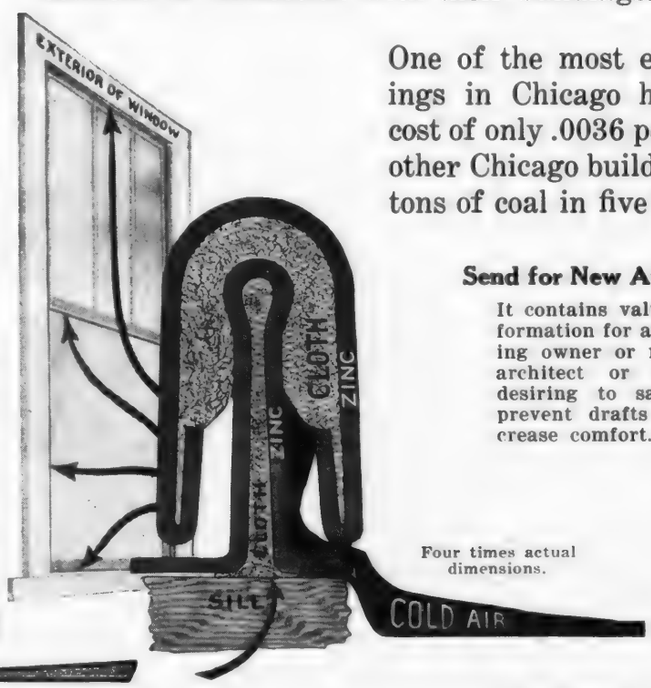
Athey Cloth-Lined Metal Weatherstrips change any wood or steel window from a rattling, loose, drafty sash to one that works smoothly and quietly and is absolutely draft - proof when closed.

Why force the Heating Plant by trying to heat all outdoors when a simple Athey installation quickly pays for itself with the saving in fuel?

1st Sufficient Fuel—Regardless
2nd Minimum Fuel—and Heat
conserved with ATHEY Cloth-Lined Metal Weatherstrips

Heating Engineers are fast learning the science of estimating radiation with the heat conservation resulting from ATHEY Cloth-Lined Metal Weatherstrips taken into consideration.

Hundreds of Office Buildings, Hotels, Hospitals, Schools, etc., as well as thousands of private residences all over America are enjoying the results of the most profitable investment in connection with their buildings.



Four times actual dimensions.

One of the most exposed buildings in Chicago has a heating cost of only .0036 per cu. ft. Another Chicago building saved 572 tons of coal in five months.

Send for New Athey Book

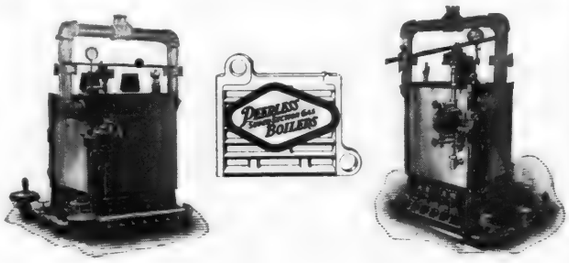
It contains valuable information for any building owner or manager, architect or engineer desiring to save fuel, prevent drafts and increase comfort.

Athey

CLOTH-LINED METAL WEATHERSTRIPS

ATHEY COMPANY
6077 W. 65th St., CHICAGO
Representatives in all Principal Cities and in Canada.

A Few Prominent Hotel Buildings Athey-Weatherstripped for Economy and Comfort



The demand for gas heating is making two boilers grow where only one grew before

THE demand for gas heating is making two boilers grow where only one grew before. You do not have to wait for a coal boiler to wear out or a new house to be built.

Everyone wants to escape from coal and ashes, and have clean safe automatic heat.

Peerless has built gas boilers for sixteen years.

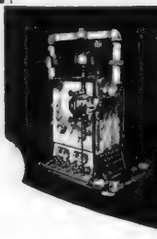
The Peerless Super Section Gas Line is complete, efficient and up to date in every way.

Our agents want to work with the heating trade.

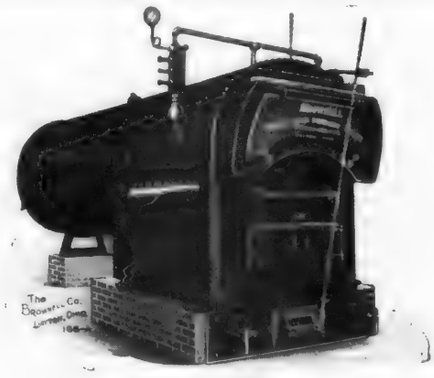
Our ratings are guaranteed and show how much load each size will handle.

Let us help you get some business. Write for Literature and Catalogues.

The Peerless Heater Company
BOYERTOWN, PA.



PEERLESS
Super Section
Gas Boilers



Brownell Portable, Direct Draft Boiler

Sheer Excellence
And Nothing Less

can keep any product on the market 73 years. In the case of Brownell Boilers that excellence is due to designs that are sound basically, up-to-date, and exactly suited to particular requirements.

Many styles in varying capacities—every one built to meet the ASME Code and the Boiler Laws of your own State.

Consult nearest Brownell representative, or write Home Office. Also write us for Bulletin B-6-A.

THE BROWNELL COMPANY, Dayton, Ohio

BROWNELL BOILERS

New Home Study Course in Gravity Steam and Water Heating

The New Home Study Course in Gravity Steam and Water Heating which has been one of the most popular features in THE HEATING AND VENTILATING MAGAZINE during the past two years is now ready in loose-leaf form (without instruction features) for the astonishing low price of

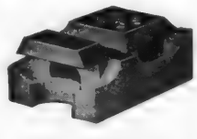
$10.00

Never before offered in reprinted form except to purchasers of the correspondence course which sells for $120.00. Send for full details.

HEATING & VENTILATING MAGAZINE CO.
30 Fourth Avenue **NEW YORK**

Burn anything from Egg to Screenings with Pyramid Grates

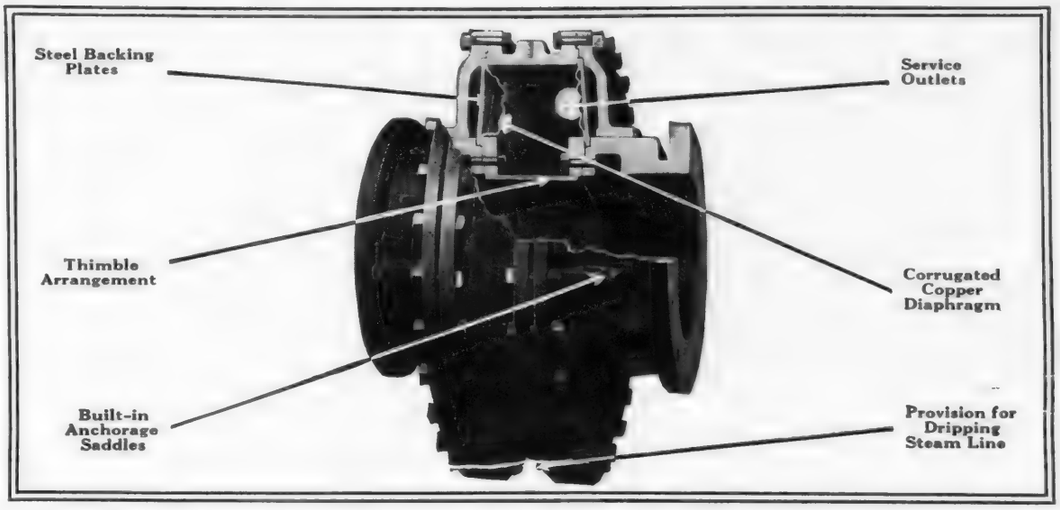
The wide range in fuel which **PYRAMID GRATES** burn makes them highly economical.



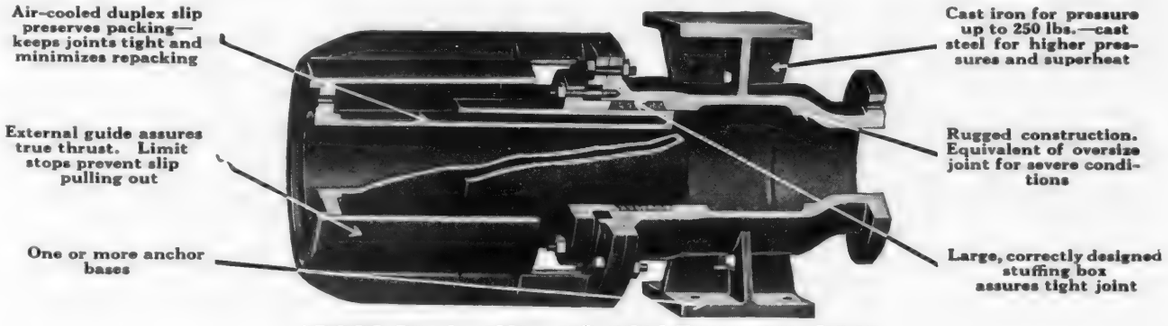
Let us show you how you can cut your coal bills and have satisfactory heating.

PYRAMID IRON PRODUCTS CO.
230 East 41st Street **New York City**

Packless or Slip Type



IN ADSCO Packless Expansion Joints (Variators) you will find the required flexibility provided by a corrugated copper diaphragm, thin enough to permit the maximum number of flexings; also such features as service outlets, anchorage saddles and other cost-cutting combinations. Model "O" *Single* with 1⅜" traverse and *Double* (illustrated above) with 2¾" traverse, for 50 lbs. pressure has service outlets, anchorage and drip. Model "P" is made in double type only for 125 lbs. pressure, 2" traverse, without service outlet or anchor.


Air-cooled duplex slip preserves packing—keeps joints tight and minimizes repacking
Cast iron for pressure up to 250 lbs.—cast steel for higher pressures and superheat
External guide assures true thrust. Limit stops prevent slip pulling out
Rugged construction. Equivalent of oversize joint for severe conditions
One or more anchor bases
Large, correctly designed stuffing box assures tight joint

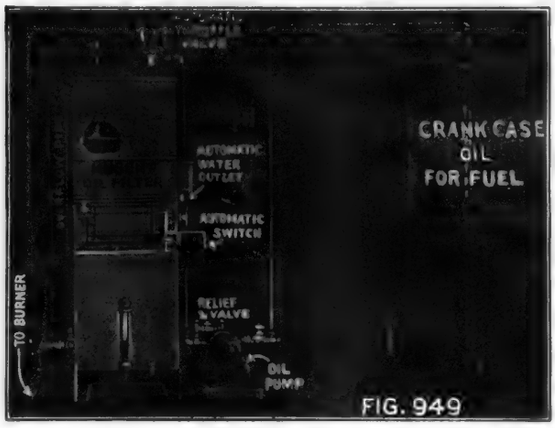
ADSCO Duplex-Sleeve Guided Expansion Joint

ADSCO Slip Type Expansion Joints are made in thousands of sizes and types for pipe lines conveying steam, oil, air, gases or liquids. Built for any range of pressure, single or double-slip—with or without anchorage, service and drip outlets—also with duplex-sleeve for extra high pressure and temperature.

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

ADSCO EXPANSION DEVICES

Nugent Crank Case Fuel Oil Filter



HEAT YOUR BUILDING WITHOUT COST

BY BURNING DISCARDED CRANK CASE OIL

NO MORE BURNER TROUBLE

Write for catalog

WM. W. NUGENT & COMPANY

409 N. Hermitage Ave., Chicago, U. S. A.

Builders since 1897 of

Oiling Systems — Oiling Devices
Oil Filters — Oil Pumps

NUGENT TRADE MARK

Full Automatic

Any Capacity

Read this Letter

MONARCH GARAGE
1122-1130 HOLLYWOOD AVENUE AT THE L
CHICAGO, ILL.

Wm. W. Nugent & Co. December 19,1927.
Chicago,Ill.

Gentlemen:-

About a year and a half ago we purchased from you a Nugent Oil Filter and motor driven oil pump to filter automobile crank case oil for our oil burner.

This purchase has been one of the best investments we ever made, because the apparatus paid for itself in less than three months. We operate our burner on the filtered crank case oil entirely, consequently we have no fuel bills.

The filter removes the water, dirt, grit, and carbon from the oil so efficiently that the fine mesh strainer at the burner never has to be cleaned, and the burner operates perfectly.

Cleaning the filter requires only ten minutes twice a week and there is no other upkeep to the filter, as the filtering elements will last for years without renewing.

We are very pleased with the filter and pump as well as the service you have given us. We highly recommend your apparatus to anyone.

Very truly yours,

MONARCH GARAGE
By E. L. Folk

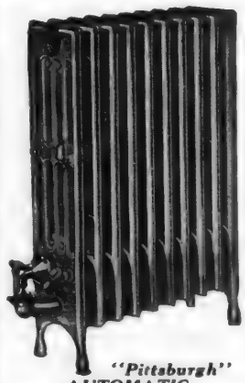
Scale can't bind this stop and check valve

SCALE FORMATION, the bugaboo of interior dash pot valves, will never cause this Davis Stop and Check Valve to stick. The dash pot is outside of the body of the valve! Never coming in contact with the steam, this oil dash pot will always be free of the binding scale formation that causes other valves to stick. This perfection of design, together with the sturdy construction characteristic of all Davis Valve Specialties, is absolute assurance against a reversal of steam flow from the boilers.

G. M. Davis Regulator Co.
436 Milwaukee Ave., Chicago, Ill.

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1876

H & V 7—Gray

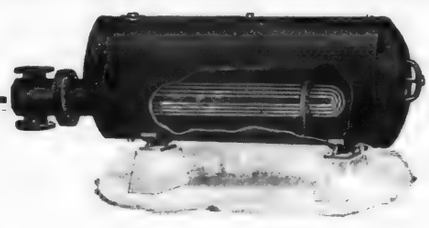


STEAM HEAT *without* BOILER

No Work No Worry — It's Easy to Operate

"Pittsburgh" AUTOMATIC GAS STEAM RADIATOR

AUTOMATIC GAS-STEAM RADIATOR COMPANY
PITTSBURGH, PA.



"Frank"ly

speaking O.E.F. U-Tube and Straight Tube heaters are of a decidedly efficient character. Made of flange steel throughout.

Write our engineering department for full details.

O. E. Frank Heater & Engineering Co., Inc.
Factory and Offices at Buffalo, N. Y.

Walls and Pavement of Gold

THICK foundation walls and pavements are worth their weight in gold when it becomes necessary to tear them out. A costly job of this kind was avoided by the owner of a new Boston building, for which steel shell storage heaters were originally ordered. The owner changed to cast iron storage heaters made by National and is now assured that the heaters will wear and function as long as the building stands.

You invest wisely when you buy a National Cast Iron Storage heater, with its long and satisfactory service. There will be no corrosion, no replacement, no rusty water, no leaky joints.

National Heaters are widely used in Hotels, Clubs, Hospitals, Colleges, Office Buildings, Apartment Houses, etc.

Ask us to send you Bulletin 65. We will be glad to have our engineers call, and to furnish quotations on

NATIONAL Storage U BEND TYPE Heater

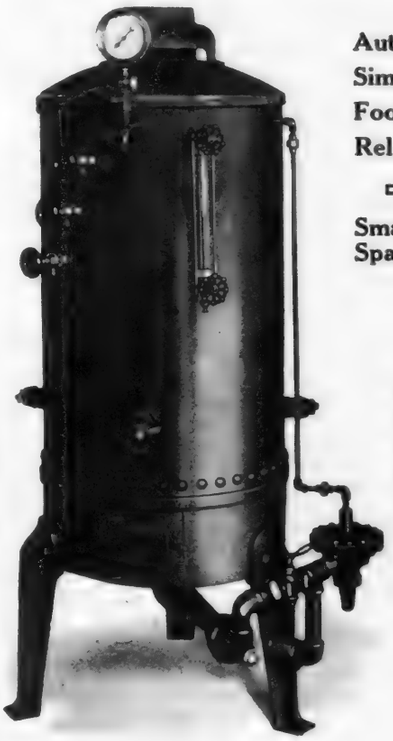
The National Pipe Bending Co.

Established 1883

120 River St., New Haven, Conn.

BOSTON NEW YORK PHILADELPHIA

When High Pressure Steam Is Needed, Use a McKee Boiler



Automatic
Simple
Fool Proof
Reliable

Small Floor Space Required

McKee Boilers Made in Sizes from ½ H.P. to 50 H.P.

During the Summer Months many companies shut down their big boilers and install a McKee to meet small steam requirements. Why not get some of this "change over work" by showing your customers How to Cut Expenses During Summer Months.

Write for
"Cutting Steam Costs during Summer Months"

Eclipse Fuel Engineering Co.

Rockford, Ill.

OIL HEAT—AS BENEVOLENT AS SUNSHINE

Building on the Safe Side

THAT oil heating offers the heating trade prolific possibilities for profits is a fact now so well established as to permit of no controversy.

The extent to which the possibilities are capitalized upon will be in direct ratio to the reputation for reliability which the oil heating dealer builds for himself.

Such a reputation may be most quickly gained by harnessing your business to the confidence and good will being created for oil heating by the Oil Heating Institute. This involves no obligation in any way but your moral support and cooperation.

The Oil Heating Institute is operated not alone to acquaint the public with the advantages of oil heating, but as a *working partner* of the dealer, to make it easier for him to sell his product. It guarantees the industry to the public and to itself.

Your assurance that the heating plants manufactured by the members of the Oil Heating Institute will function reliably is found in the standards of efficiency and safety to which all members must conform.

The manufacturing members of the Oil Heating Institute want to cooperate with you in every way that will save you time and increase the good will of your customers. They have published a series of booklets on oil heat written by national authorities. They contain complete and impartial information, together with illustrations on approved oil heating appliances. The coupon will bring any of them to you.

This is the Emblem of the *Oil Heating Institute*

It is the symbol of satisfactory public service in oil heating.

Only the manufacturers who are members of the Oil Heating Institute are permitted to use it.

These manufacturers have earned their membership through the enthusiasm of thousands of home owners whom they have provided with efficient and dependable oil heat.

This emblem protects you, and it will be protected, on your behalf, by the Oil Heating Institute.

The Oil Heating Institute is prepared to furnish special information on the heating of churches, theatres, hotels, apartment houses and office buildings, and on the various heat treating processes of industry.

OIL HEATING INSTITUTE

420 Madison Avenue New York

Check the book you want

MAIL THE COUPON TODAY!

OIL HEATING INSTITUTE H. & V.-7
420 Madison Ave., New York City

Please send me, free of charge, the following information on oil heating equipment:

Does it Pay to Install an Oil Heater?.....
Are Oil Heaters Perfected?.. .....
What About the Supply of Oil Fuel? ....
Making Better Use of the Basement.....

Name .....
Address.....
City.....State.....

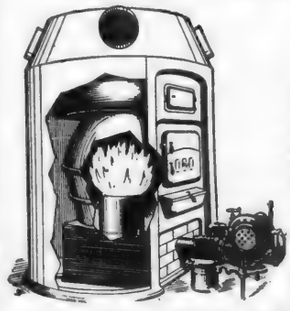
FITZGIBBONS STEEL BOILERS
"The Boiler you can afford to own"

Steel-assured dependability and durability
Advanced scientific design
Extraordinary economy
Compact, brickless construction
Practically no maintenance expense
Proved by forty years of faithful service
Heating Sizes from 300 to 36,000 sq. ft. Steam Rating
Power Sizes from 40 to 350 H. P.

Complete information, ratings and dimensions upon request

FITZGIBBONS BOILER CO.
INCORPORATED
570 Seventh Ave., New York, N. Y.

You Never Have to Resell
A LACO



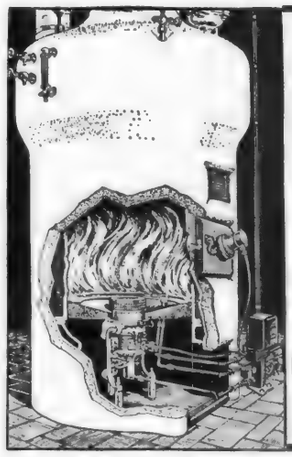
Here's one oil burner that stays sold. Every user is a booster. Practically noiseless, economical to operate, will not bother radios. For warm air, steam, hot water, or vapor heat systems. No electric or gas ignition.

$240.00

Complete with full Automatic Controls

Here is an opportunity for dealers to cash in on 1928 oil burner business. Write for full particulars.

LACO GAS BURNER COMPANY
410 Union Street, Griswold, Iowa, U. S. A.



Proved, Silent, Safe

TORIDHEET Oil Burners are giving super-satisfaction in thousands of installations. Clean, fully automatic, and listed as standard by the Underwriters' Laboratories. Price recommends them. Performance makes every user a booster.

Dealers: Steady sales and a minimum of servicing make the Toridheet franchise unusually profitable. *Write promptly.*

Cleveland Steel Products Corp.
Madison at West 74th St., Cleveland, O.

TORIDHEET OIL BURNER
FOR BETTER HOME HEATING

W. J. Gilmore Building, Pittsburgh

Could you properly heat a building like this with steam shut off two-thirds of the time?

That's what Hornung Master Control Valves made possible in the heating of the W. J. Gilmore Drug Company Building, Pittsburgh. *Note carefully chart and table below.*

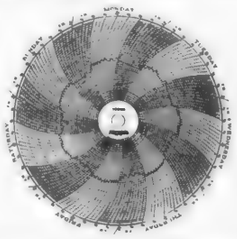
If no customer can use more steam than is really needed, you will save in the boiler room in mild weather, and in cold weather will have enough steam to serve more customers than you can now take on. And complaints from your customers about big bills will stop.

Steam Consumption

	Estimated	Actual
October, 1927	556,000	215,000
November	1,205,000	1,035,000
December	1,668,000	1,204,000
January, 1928	1,853,000	1,496,000
February	1,462,000	1,141,000
March	1,297,000	1,104,000
	8,041,000	6,195,000

SAVING — 1,846,000
With Hornung Master Control Valve

Temperature Chart No. 79903 covers Master Control performance for week ending February 8, 1928. It was taken from Hornung 8" Master Control Valve, controlling both pressures and temperatures in one valve. Clock type thermostat used.



Some of the largest plants in the country are stopping heat waste with Hornung Master Control Valves. Ask us for more particulars.

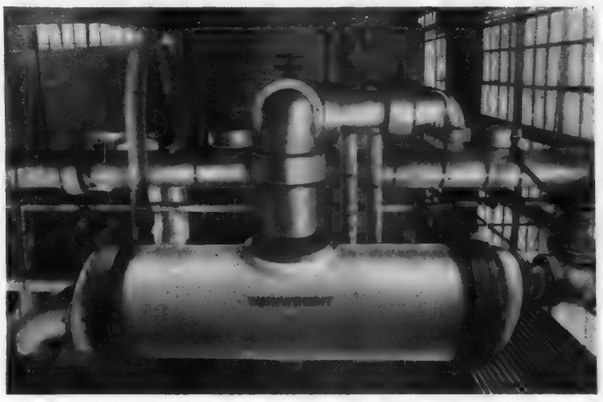
CENTRAL HEAT APPLIANCES

J. C. Hornung, *Engineer*

343 S. DEARBORN ST., CHICAGO

(4124)

Heating 60 Homes With One Wainwright Heater



Wainwright hot water heater used for heating sixty homes. The temperature of the system is controlled by varying the steam pressure and the water velocity through the system.

Wainwright heaters are built for any size project, hotels, apartments and hospitals.

The American Fabric Company of Bridgeport, Conn., supplies hot water for heating 60 homes owned by the Bridgeport Housing Company.

Exhaust steam at 5 lb. gage is supplied to a Wainwright heater designed to raise 325 gal. of water per minute from 175 to 200 deg. F. Temperature of the entire system is controlled from the power plant and varied according to outside temperature for comfortable heating.

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.
Branches in Principal Cities

Foreign Associates:—
Foster Wheeler Limited; London, England.
Foster Wheeler Limited; Toronto-Montreal-Vancouver, Can.

AERO UNIT COAL PULVERIZERS
AIR HEATERS CENTRIFUGAL PUMPS
CONDENSERS COOLING TOWERS
ECONOMIZERS EVAPORATORS
EXPANSION JOINTS FEED WATER HEATERS

FOSTER WHEELER

FRACTIONATING TOWERS HEAT EXCHANGERS
STEAM JET AIR PUMPS SUPERHEATERS
TUBE STILLS VACUUM PUMPS
WATER COOLED FURNACE SURFACES
BRASS AND COPPER TUBING AND PIPE

ENGINEERS' SPECIFICATION INDEX

ACID FUME EXHAUSTERS
Duriron Company, Inc., The, Dayton, O.

AIR COMPRESSORS
American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Typhoon Fan Co., New York.
York Heating & Ventilating Corp., Phila., Pa.

AIR COOLING & DRYING SYSTEMS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass
Thermal Units Co., Chicago, Ill.

AIR ELIMINATORS
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

AIR FILTERS
American Blower Co., Detroit, Mich.
Connor Co., Inc., The W. B., New York.
DeBothezat Impeller Co., Inc., New York
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa
National Air Filter Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Staynew Filter Corp., Rochester, N. Y.

AIR SEPARATORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Swartwout Co., The, Cleveland, Ohio.
Western Engineering Co., San Francisco, Calif.

AIR WASHERS
American Blower Co., Detroit, Mich
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.

BELTING
Alexander Bros., Inc., Philadelphia, Pa.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BLOWERS, PRESSURE
American Blower Co., Detroit, Mich
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York

BLOWERS, ROTARY
Wing Mfg. Co., L. J., New York

BLOWERS, TURBINE
Buffalo Forge Co., Buffalo, N. Y
Wing Mfg. Co., L. J., New York

BOILER CEMENT
Banner Rock Products Co., Alexandria, Ind.
Johns-Manville Corp., New York

BOILERS, DOWN-DRAFT
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Fitzgibbons Boiler Co., Inc., New York
Kewanee Boiler Corp., Kewanee, Ill.
Leader Iron Works, Decatur, Ill.
Molby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

BOILERS, GAS-FIRED
American Gas Products Corp., New York.
American Radiator Co., Buffalo, N. Y
Eclipse Fuel Engineering Co., Rockford, Ill.
Frost Mfg. Co., Galesburg, Ill
Leader Iron Works, Decatur, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
National Radiator Corp Johnstown, Pa
Stanwood Corporation, Cincinnati, Ohio.

BOILERS, HEATING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Bryan Steam Corp., Peru, Ind.
Burnham Boiler Co., Irvington, N. Y.
Coatesville Boiler Works, Coatesville, Pa.
Fitzgibbons Boiler Co., Inc., New York.
Freeman Mfg. Co., Racine, Wis.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corporation, New York.
Heggie-Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Leader Iron Works, Decatur, Ill.
Molby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Peerless Heater Co., Boyertown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Spencer Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

BOILERS, MAGAZINE FEED
Gorton Heating Corporation, New York.
Molby Boiler Co., New York.
Newport Boiler Co., Chicago, Ill.
Spencer Heater Co., Williamsport, Pa.

BOILERS, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Johnston Brothers, Inc., Ferrysburg, Mich.
Leader Iron Works, Decatur, Ill.

BOILERS, POWER
Eclipse Fuel Engineering Co., Rockford, Ill.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Heggie-Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York
Foster Wheeler Corporation, Carteret, N. J
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven Conn
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Ross Heater & Mfg Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass

COPPER BOILERS
Badger & Sons Co., E. B., Boston, Mass.

COPPER KETTLES
Badger & Sons Co., E. B., Boston, Mass.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT
Buckeye Blower Co., The, Columbus, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Pecco, Inc., St. Louis, Mo.

DAMPER LOCKS, SELF-LOCKING
Northern Weatherstrip Co., Duluth, Minn.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

DISTILLERS, (WATER)
Badger & Sons Co., E. B., Boston, Mass
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES
International Fuel Service Corp., Bridgeport, Conn.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
Pecco, Inc., St. Louis, Mo.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

ENGINES, STEAM, AUTOMATIC
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Sturtevant Co., B. F., Hyde Park, Boston, Mass

ENGINES, STEAM, HIGH SPEED
American Blower Co., Detroit, Mich
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio

EQUALIZING LOOPS
Hoffman Specialty Co., New York
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., The, Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EXHAUST SYSTEMS, ACID
Duriron Company, Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit Mich.
Foster Wheeler Corporation, Carteret N. J.
Fulton Sylphon Co., Knoxville, Tenn
Gradon Mfg. Co., Philadelphia, Pa.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill
Ross Heater & Mfg. Co., Buffalo, N. Y
Walworth Co., New York
Webster & Co., Warren, Camden, N. J

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O

FANS, DISC PRESSURE
DeBothezat Impeller Co., Inc., New York.

FANS, SUPPLY AND EXHAUST
American Blower Co., Detroit, Mich
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Boston, Mass.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky
Connor Co., Inc., The W. B., New York
Eclipse Fuel Engineering Co., Rockford, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

An effective suburban sewage ejector station

LARCHMONT, NEW YORK, offers an interesting example of the use of Jennings Sewage Ejectors for handling sewage in suburban residential communities.

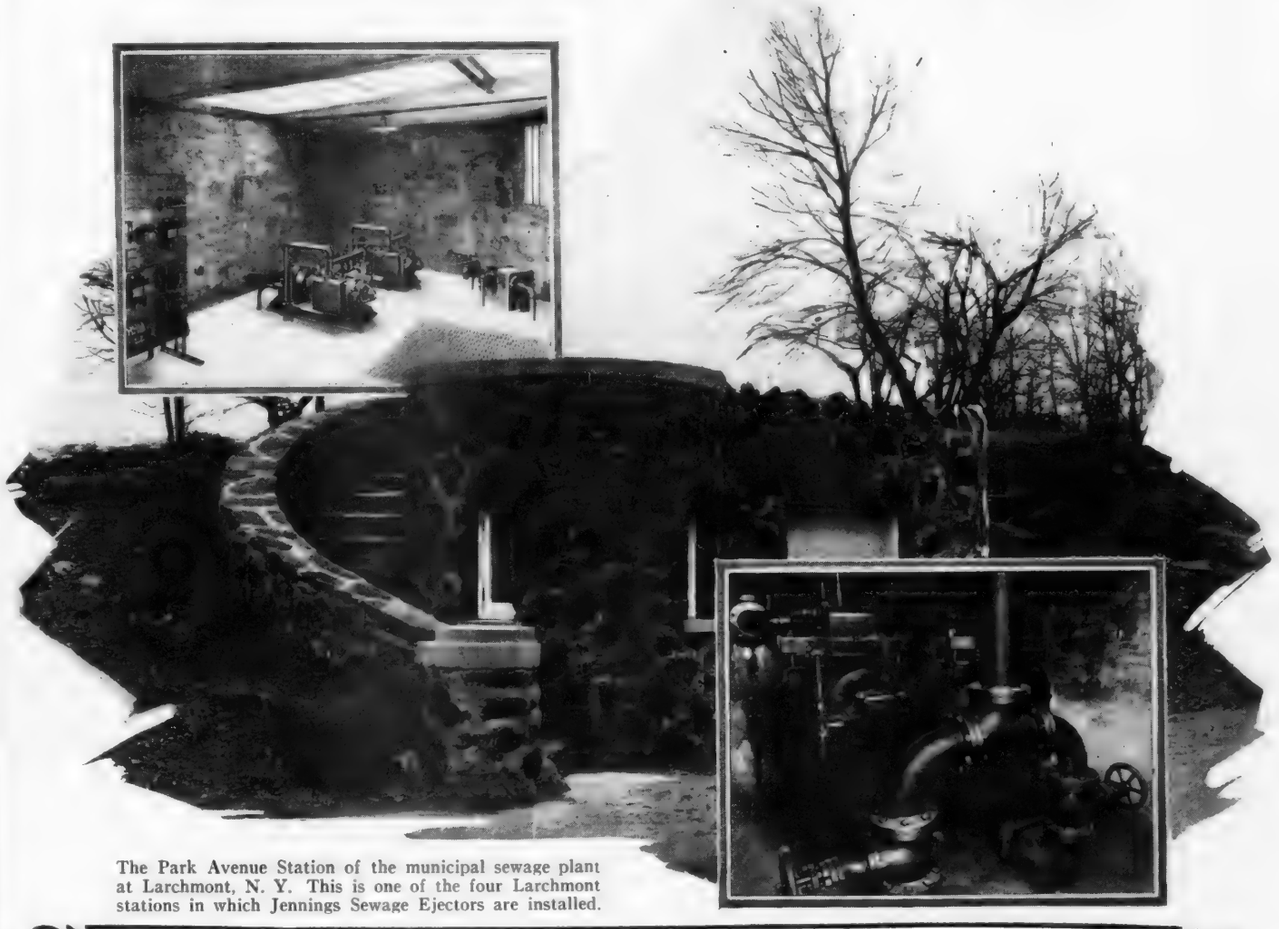
Here, eight units are installed in the Magnolia, Park, Willow and Woodbine Avenue Stations.

Jennings Sewage Ejectors are supplied in several standard capacities up to 1500 g.p.m. Heads up to 50 ft. For pumping unscreened sewage or drainage from basements below the street sewer level, handling crude sewage from low level districts, pumping effluent, sludge and other heavy liquids. *Write for Bulletin* 67.

NASH ENGINEERING CO., 12 WILSON ROAD, SOUTH NORWALK, CONN.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS :: CONDENSATION PUMPS :: COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES :: STANDARD AND SUCTION CENTRIFUGAL PUMPS :: HOUSE SERVICE PUMPS :: SEWAGE EJECTORS :: SUMP PUMPS :: FLAT BOX PUMPS :: MARINE PUMPS

Jennings Pumps



The Park Avenue Station of the municipal sewage plant at Larchmont, N. Y. This is one of the four Larchmont stations in which Jennings Sewage Ejectors are installed.

Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, CRANK CASE OIL
Nugent & Co., Inc., Wm. W., Chicago, Ill.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

FITTINGS, DISTRIBUTOR
Blake Specialty Co., Rock Island, Ill.

FITTINGS, FLANGED
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York

FLANGES
Clow & Sons, James B., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.

GASKETS, ASBESTOS
Jenkins Bros., New York.
Johns-Manville Corp., New York.

GASKETS, METALLIC
Jenkins Bros., New York.

GASKETS, RUBBER
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow & Sons, James B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
United States Radiator Corp., Detroit, Mich.

GAUGES, DRAFT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, TANK
King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, WATER
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS, (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.
Pyramid Iron Products Corp., New York.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRILLES
Metalace Corporation, Boston, Mass.

HEAT CABINETS
Clow & Sons, James B., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Metal Stamping Co., Long Island City.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Rome-Turney Radiator Co., Rome, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Blake Specialty Co., Rock Island, Ill.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Leader Iron Works, Decatur, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Moloy Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Taco Heaters, Inc., New York.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Gradon Mfg. Co., Philadelphia, Pa.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER, (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Taco Heaters, Inc., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

HEATING SYSTEMS, GAS
Clow & Sons, James B., Chicago, Ill.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm. H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Banner Rock Products Co., Alexandria, Ind.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.
Johns-Manville Corp., New York.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

"THE AUTOMATIC ALTERNATOR"

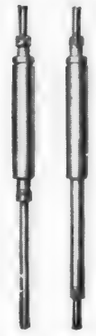


Fig. C-73
Showing open and closed positions of Alternator

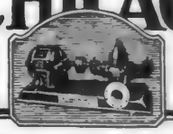
for Duplex House, Sump and Sewage Pumps

1—Automatically transfers the operation from one pump to another, thereby—
—equalizing the wear on both pumps,
—increasing the life of both pumps.

2—Prevents rusting of idle pump, thereby—
—avoiding constant blowing of fuses,
—avoiding burning out of motors and starters.

3—Keeps both pumps in good running order, thereby—
—maintaining a much higher efficiency,
—saving operating expense and repair bills.

CHICAGO PUMP COMPANY



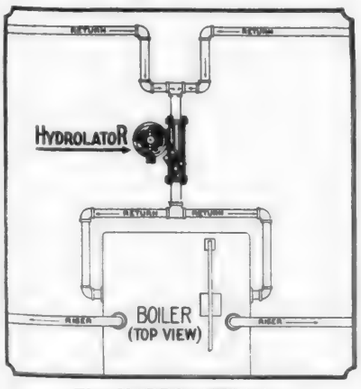
SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM

Phone, Brunswick 4110 2336 Wolfram St., Chicago

"Doing More Than We Anticipated"

The satisfaction which the HYDROLATOR has given this heating contractor in clearing up a "sick" hot water system is a typical example of what it is doing for many others. In several instances the HYDROLATOR has cured systems after all other methods had failed.

This new device stimulates circulation, eliminates "traps" and "short-circuit," forces water to *all* radiators and reduces fuel consumption. Low operating cost.



The HYDROLATOR installed on a 2-return system.

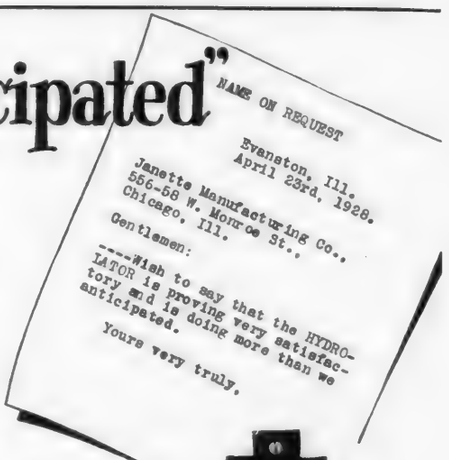
Write for Bulletin 128-*H*.

Janette Mfg. Company

556-58 West Monroe Street
CHICAGO

Singer Bldg., 149 Broadway, NEW YORK
Real Estate Trust Bldg., PHILADELPHIA

Harrison Sales Company
SEATTLE, PORTLAND, SPOKANE


NAME ON REQUEST

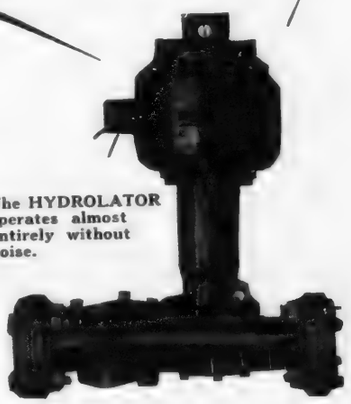
Evanston, Ill.
April 23rd, 1928.

Janette Manufacturing Co.,
556-58 W. Monroe St.,
Chicago, Ill.

Gentlemen:

----Wish to say that the HYDROLATOR is proving very satisfactory and is doing more than we anticipated.

Yours very truly,



The HYDROLATOR operates almost entirely without noise.

Stimulates circulation by means of a motor-driven rotary pump. Intermittent operation. Manual or automatic control. Requires little attention.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Mason Regulator Co., Boston, Mass.
New York Blower Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sturtevant Co., B F., Hyde Park Boston, Mass.
Wing Mfg. Co., L. J. New York.

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit Mich

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass
Spray Engineering Co., Boston, Mass

METERS, PITOT TUBE
American Blower Co., Detroit, Mich
Buffalo Forge Co., Buffalo, N. Y

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Builders Iron Foundry, Providence, R. I.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill
Lincoln Electric Co., Cleveland, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
American Nokol Corp., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Cleveland Steel Products Corp., Cleveland, Ohio
Electrol, Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
Laco Gas Burner Co., Griswold, Iowa.
McIlvaine Burner Corporation, Chicago, Ill.
Nu-Way Corporation, Rock Island, Ill.
Pascoe Company, The Wm. H., Chicago, Ill.
Petroleum Heat & Power Co., New York.
Preferred Oil Burners, Inc., Peoria, Ill.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill.
York Oil Burner Co., York, Pa.

OIL BURNER EQUIPMENT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Teesdale Mfg. Co., Grand Rapids, Mich.
Preferred Utilities Mfg. Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster Electric Co., Racine, Wis.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Webster Electric Co., Racine, Wis.

PIPE, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

PIPE, CAST IRON
Clow & Sons, James B., Chicago, Ill.

PIPE, STEEL
Clow & Sons, James B., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PIPE, WOOD
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE HANGERS
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York

PIPE THREADING & CUTTING MACHINES
National Pipe Bending Co., New Haven, Conn.

PRESSURE REDUCING VALVES
(See Regulators, Pressure)

PULLEYS, VARIABLE SPEED
Horton Mfg. Co., Minneapolis, Minn.

PUMPS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford,
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Connor Co., Inc., The W. B., New York.
Janette Mfg. Co., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Chicago Pump Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATOR ENCLOSURES OR SHIELDS
American Metal Products Corp., St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

RADIATORS, BRASS
Rome Brass Radiator Corp., New York
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.

RADIATORS, GAS HEATED
Automatic Gas Steam Radiator Co., Pittsburgh, Pa.
Clow & Sons, James B., Chicago, Ill.

RADIATORS, STEAM & WATER
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Moby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
United States Radiator Corp., Detroit, Mich.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Regulator Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Teeple Co., L. R., Portland, Oregon

REGULATORS, TEMPERATURE
(See Temperature Control).

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Gradon Mfg. Co., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Gradon Mfg. Co., Philadelphia, Pa
Illinois Engineering Co., Chicago, Ill
National Pipe Bending Co., New Haven Conn.
Sims Co., The, Erie, Pa.
Swartwout Co., The, Cleveland, Ohio
Webster & Co., Warren, Camden, N. J

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York
General Air Filters Corp., New York
Schutte & Koerting Co., Philadelphia Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray).

STRAINERS, OIL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill
Janette Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia Pa.

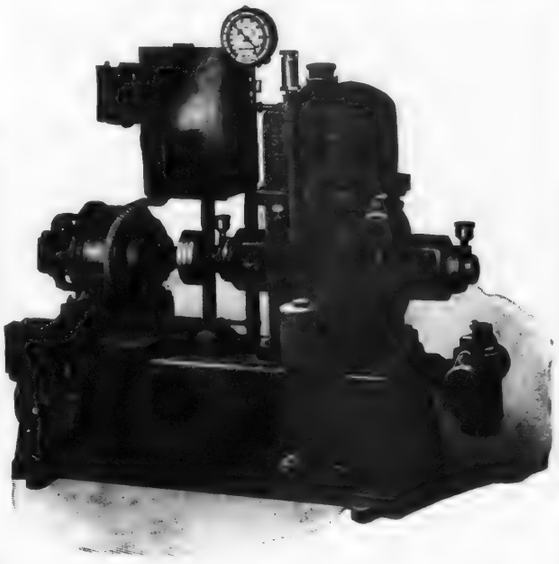
STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis
Ross Heater & Mfg. Co., Buffalo, N. Y
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia Pa.
Spray Engineering Co., Boston, Mass

TEMPERATURE CONTROL
Absolute Con-Tac-Tor Corp., Elkhart Ind.
American Radiator Co., Buffalo, N. Y
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark N. J.
Foxboro Co., Inc., The, Foxboro, Mass
Fulton Sylphon Co., Knoxville, Tenn
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill
Powers Regulator Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Raymond, F. I., River Forest, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Teeple Co., L. R., Portland, Oregon
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

THERMOMETERS, RECORDING & INDICATING
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa
Pierce, Butler & Pierce Mfg. Corp., New York

SKIDMORE



Which Will You Have

high or low water line in the system when operating on float control?

The Skidmore pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

The automatic starter together with vacuum regulator and float switch are mounted on this unit. All wiring is installed at the factory.

Bulletin No. 5 illustrating this unit is now available.

SKIDMORE CORPORATION

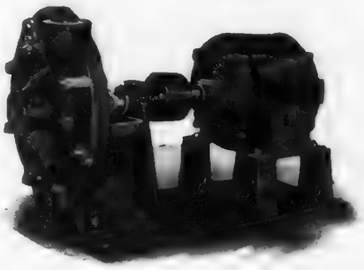
General Offices and Factory

1535 Dayton St. CHICAGO, U.S.A.

Representatives in principal cities

Canadian Representatives, Darling Bros., Limited
120 Prince Street, Montreal

Always Ready For SERVICE



"Buffalo" CH Centrifugal Pump

Note that the discharge is adjustable to eight different positions to adapt to the conditions of the installation.

Satisfied users throughout the country have found the "Buffalo" Single Stage Single Suction Class "CH" centrifugal pump a husky inexpensive pump for handling any kind of liquid, hot or cold, steady or intermittent service.

This pump has a decided advantage when handling gritty water or liquid of any kind as it has an open impeller and produces more head than similiar pumps using an enclosed impeller.

All parts made to standard gauges and jigs and are interchangeable. Made from the highest grade material obtainable. Five sizes, No. 1 to 3 are made for either direct connection to motor or belt drive.

Complete Specifications sent on request

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480 Broadway, Buffalo, N. Y.

In Canada:
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Powers Regulator Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

THERMOSTATS

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

TRAPS, BUCKET

Swartwout Co., The, Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Sarco Co., Inc., New York.
Swartwout Co., The, Cleveland, Ohio.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Works, Three Rivers, Mich.

TRAPS, LIFTING

Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., The, Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Works, Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNDERGROUND PIPE CONDUITS

American District Steam Co., North Tonawanda, N. Y.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Duriron Company, Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Russell & Co., W. A., New York.
United States Radiator Corp., Detroit, Mich.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corporation, New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Stay-Rite Co., Inc., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, BALANCED

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, BLOW-OFF

Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York

VALVES, CHECK

Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Phila., Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Walworth Co., New York

VALVES, MAGNETIC

Absolute Con-Tac-Tor Corp., Elkhart, Ind.

VALVES, NON-RETURN

Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Capitol Brass Works, Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich
Vapor Engineering Co., New York.
Walworth Co., New York
Webster & Co., Warren, Camden, N. J.

VALVES, REDUCING

(See Regulators, Pressure).

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Company, Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

VALVES, SAFETY

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
National Radiator Corp., Johnstown, Pa
Stay-Rite Co., Inc., Cleveland, Ohio.
United States Radiator Corp., Detroit, Mich.
Walworth Co., New York

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Lakeside Company, The, Hermansville, Mich.
Nelson Corp., Herman, The, Molina, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.

VENTILATING SYSTEMS, ACID

Duriron Company, Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York
Midwest Air Filters, Inc., Bradford, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, MUSHROOM

Aeolus Dickinson Co., Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corp., St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson Co., Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
Dwyer Equipment Co., Chicago, Ill.
Nelson Corp., Herman, The, Molina, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow & Sons, James B., Chicago, Ill.

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.

WELDERS, ELECTRIC ARC

Lincoln Electric Co., Cleveland, Ohio

WRENCHES, STILLSON

Walworth Co., New York.

Team Up with TEESDALE Pumps for Success

Type TU TEESDALE Automatic Pump, capacity 30 gal. per hour, listed as standard by Underwriters' Laboratories. Approved, Board of Standards and Appeals, New York.

MANY successful burner dealers attribute much of their present leadership in their communities to TEESDALE Pumps. They have found these pumps real selling helps; and when installed they protect profits by cutting servicing costs to almost the vanishing point by trouble-free, dependable operation.

We can help you to greater sales and pyramided profits as we have helped hundreds of other dealers. Sales and advertising co-operation gladly given.

Team up today with "TEESDALES"! Write today for your proposition!

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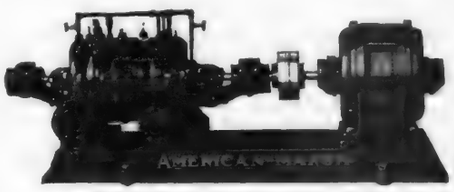
Walters Warehouse, 410 W. 52nd St.

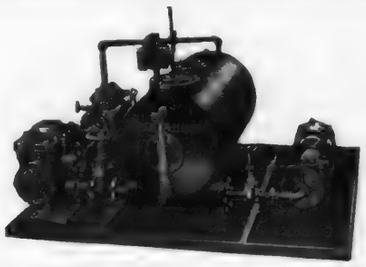
Philadelphia Branch:
3931 N. Broad Street

Pacific Coast Warehouse:
Taylor-Edwards Warehouse, Seattle

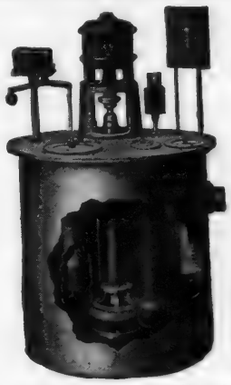
Boston Warehouse:
Wiggins Terminals



Type NM Multi-stage Centrifugal Pump for high pressure work—Bulletin 53.



Combination Steam and Centrifugal Outfit for heating systems—Bulletin 58.



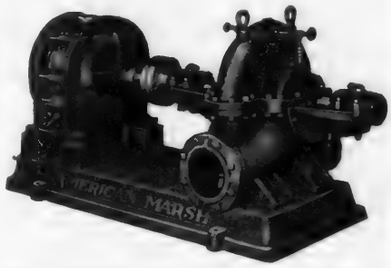
Automatic Centrifugal Sump Pump for drainage and sewage handling—Bulletin 41.

Modern-Rugged-Efficient

THE next time you have a pumping problem, you will do well to send us an inquiry. For over forty years this organization has built pumps and pumps only. They are not a side issue with us, but the main line—and that accounts for the difference. We have concentrated; become specialists in pump building and pump application.

But we do make all types of pumps, centrifugal, steam and power driven equipment. And it is equipment which has met the test of dependable, low-cost service and which has received the endorsement of engineers generally. Write for Bulletins.

AMERICAN STEAM PUMP CO., BATTLE CREEK, MICHIGAN



Type HBM Single-stage Centrifugal Pump for general service—Bulletin 38.

AMERICAN-MARSH

Centrifugal and Steam Pumping Equipment

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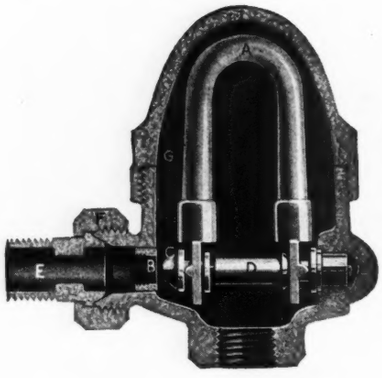

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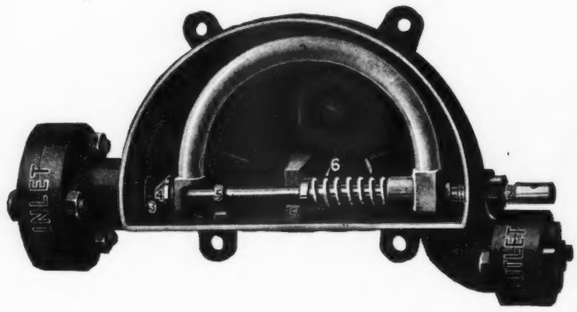

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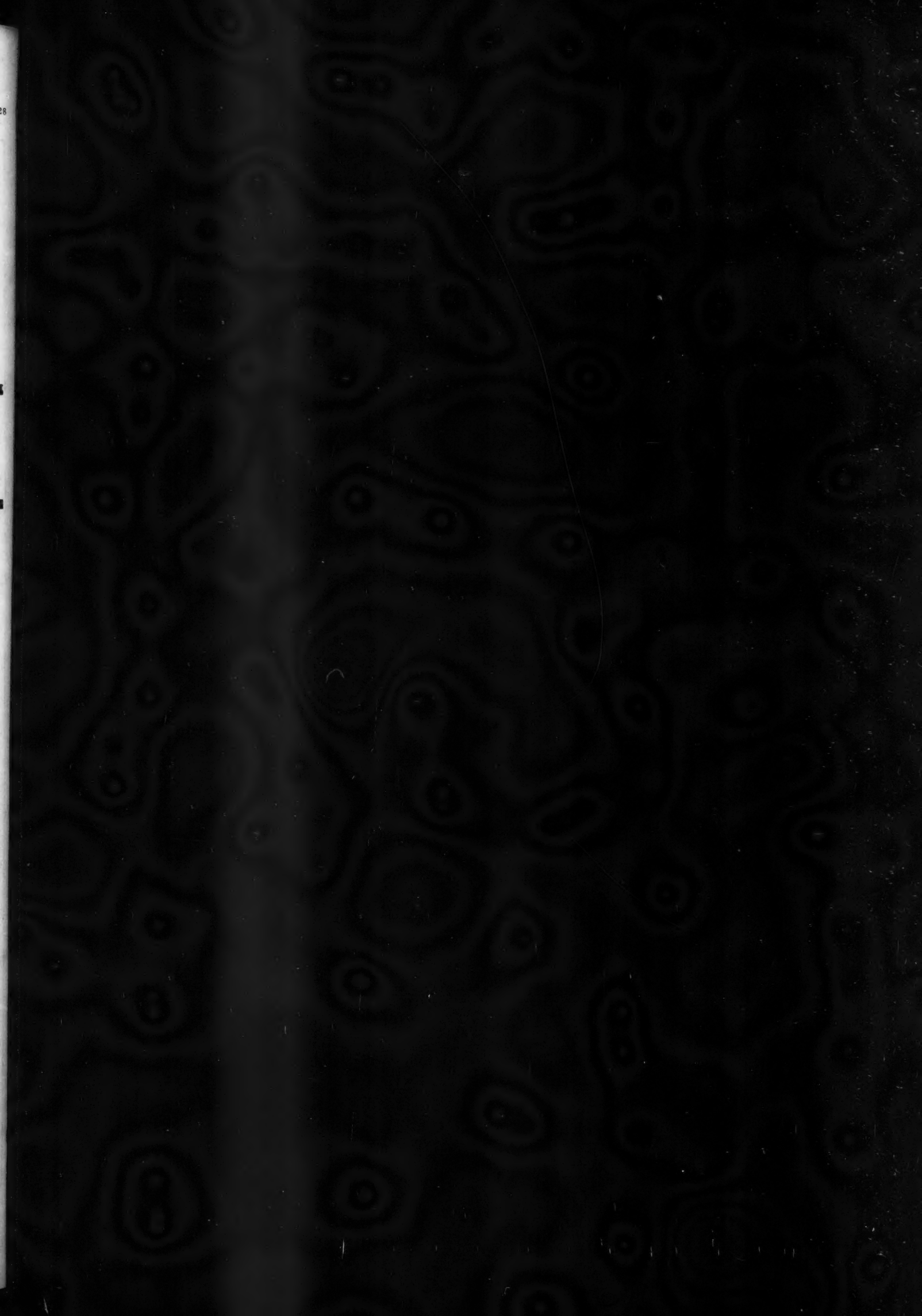
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